

**MOCK EXAM 8**  
**MATHEMATICS Compulsory Part**  
**PAPER 2**

(1  $\frac{1}{4}$  hours)

**INSTRUCTIONS**

1. Read carefully the instructions on the Answer Sheet.
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 are advised to use an HB pencil to mark all the answers on the Answer Sheet, so that wrong marks can be completely erased with a clean rubber. You must mark the answers clearly; otherwise you will lose marks if the answers cannot be captured.
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.

There are 30 questions in Section A and 15 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.  $\frac{27^{2n-1}}{9^{3n-1}} =$

- A.  $\frac{1}{3}$ .
- B. 1.
- C.  $3^{-n}$ .
- D.  $3^n$ .

2. If  $\frac{a-b}{2a} = 3 - \frac{2b}{a}$ , then  $a =$

- A.  $-\frac{7b}{5}$ .
- B.  $-\frac{5b}{7}$ .
- C.  $\frac{3b}{5}$ .
- D.  $\frac{5b}{3}$ .

3.  $m^2 - 3m + 9n - 9n^2 =$

- A.  $(m - 3n)(m + 3n - 3)$ .
- B.  $(m - 3n)(m - 3n - 3)$ .
- C.  $(m + 3n)(m + 3n + 3)$ .
- D.  $(m + 3n)(m - 3n + 3)$ .

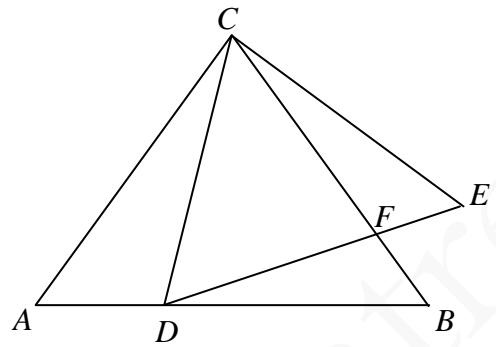
4.  $\frac{1}{4x+3} - \frac{1}{4x-3} =$
- A.  $\frac{6}{16x^2-9}$ .
- B.  $\frac{6}{9-16x^2}$ .
- C.  $\frac{8x}{16x^2-9}$ .
- D.  $\frac{8x}{9-16x^2}$ .
5. The solution of  $5 + x < 3x - 3$  or  $5 - 3x > 2$  is
- A.  $x < 1$ .
- B.  $x > 4$ .
- C.  $1 < x < 4$ .
- D.  $x < 1$  or  $x > 4$ .
6. Let  $f(x) = 2x^2 - 7x + k$ , where  $k$  is a constant. If  $f(x)$  is divisible by  $x - 5$ , find the remainder when  $f(x)$  is divided by  $2x - 1$ .
- A.  $-18$
- B.  $-11$
- C.  $12$
- D.  $19$
7. Which of the following statements about the graph of  $y = -16 + (x - 4)^2$  is true?
- A. The graph does not cut the  $x$ -axis.
- B. The graph opens downwards..
- C. The  $y$ -intercept of the graph is  $-16$ .
- D. The graph passes through the origin.

8. Let  $f(x) = (x + 2)(x + a)$ , where  $a$  is a constant. If  $f(1) = f(5)$ , then  $f(a) =$
- A.  $-8$ .
  - B.  $0$ .
  - C.  $48$ .
  - D.  $96$ .
9. A sum of \$5 000 is deposited at an interest rate of 3% per annum for 2 years, compounded quarterly. Find the interest correct to the nearest dollar.
- A. \$300
  - B. \$304
  - C. \$307
  - D. \$308
10. If the arc length and the area of a sector are  $3\pi$  m and  $15\pi$  m<sup>2</sup> respectively, then the radius of the sector is
- A. 10 m
  - B. 15 m
  - C. 20 m
  - D. 25 m
11. If  $a$ ,  $b$  and  $c$  are non-zero constants such that  $4x^2 + 2ax + a \equiv x(4x + 3b) + 2c$ , then  $a : b : c =$
- A.  $6 : 4 : 3$ .
  - B.  $4 : 6 : 3$ .
  - C.  $3 : 4 : 2$ .
  - D.  $2 : 4 : 3$ .

12. It is given that  $y$  is the sum of two parts, one part is a constant and the other part varies as  $x^2$ .  
When  $x = 1$ ,  $y = 11$  and when  $x = 2$ ,  $y = 20$ . If  $x = 3$ , then  $y =$
- A. 17.
  - B. 26.
  - C. 35.
  - D. 75.
13. There are packets of salt. The weight of salt in a packet is measured as 100 g correct to the nearest g. If  $n$  packets of salt are packed into a bag such that the weight of salt in each bag is measured as 15 kg correct to the nearest kg, find the least possible value of  $n$ .
- A. 144
  - B. 145
  - C. 150
  - D. 155
14. Let  $a_n$  be the  $n$ th term of a sequence. If  $a_4 = 19$ ,  $a_7 = 81$  and  $a_{n+2} = a_n + a_{n+1}$  for any positive integer  $n$ ,  
Then  $a_2 =$
- A. 5
  - B. 7
  - C. 12
  - D. 31
15. The base radius of a right circular cylinder is 3 times the base radius of a right circular cone while the height of the circular cone is 2 times the height of the circular cylinder. If the volume of the circular cylinder is  $324\pi \text{ cm}^3$ , then the volume of the circular cone is
- A.  $12\pi \text{ cm}^3$ .
  - B.  $24\pi \text{ cm}^3$ .
  - C.  $27\pi \text{ cm}^3$ .
  - D.  $486\pi \text{ cm}^3$ .

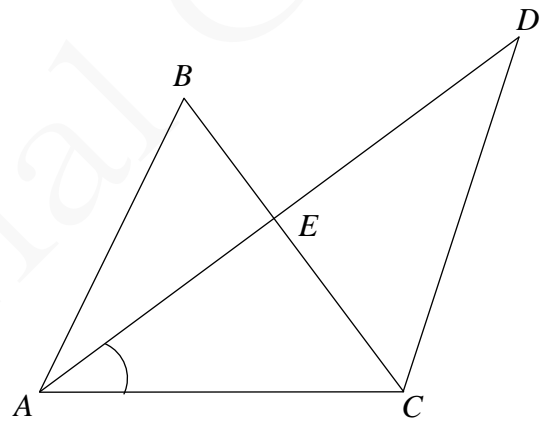
16. In the figure,  $ABC$  and  $CDE$  are equilateral triangles of side 100 cm and 90 cm respectively.  $F$  is the intersection of  $BC$  and  $DE$ . Find  $FB$ .

- A. 10 cm.
- B. 15 cm.
- C. 19 cm.
- D. 20 cm.



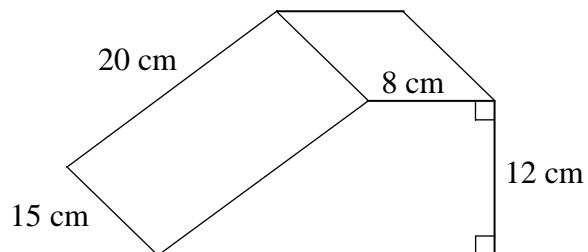
17. In the figure,  $AB = AC$  and  $AB \parallel CD$ .  $E$  is the point of intersection of  $AD$  and  $BC$ . If  $\angle AEB = 98^\circ$  and  $\angle ADC = 30^\circ$ , then  $\angle CAD =$

- A.  $44^\circ$ .
- B.  $46^\circ$ .
- C.  $48^\circ$ .
- D.  $50^\circ$ .



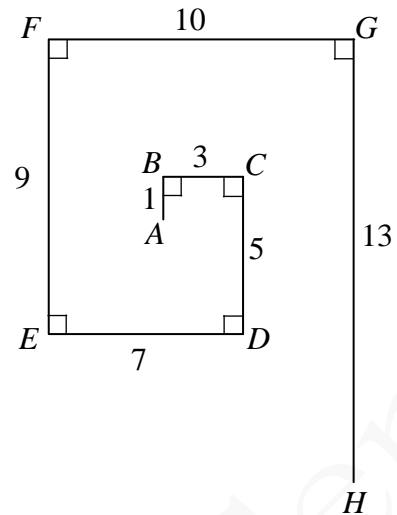
18. The figure shows a right prism. Find the volume of the prism.

- A.  $1152 \text{ cm}^3$ .
- B.  $1440 \text{ cm}^3$ .
- C.  $1800 \text{ cm}^3$ .
- D.  $2880 \text{ cm}^3$ .



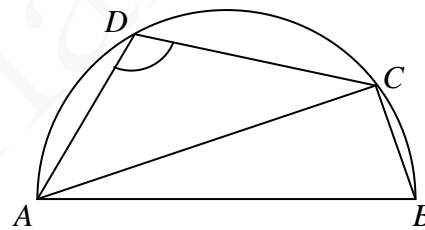
19. In the figure, the length of the line segment joining  $A$  and  $H$  is

- A. 6.
- B. 8.
- C. 9.
- D. 10.



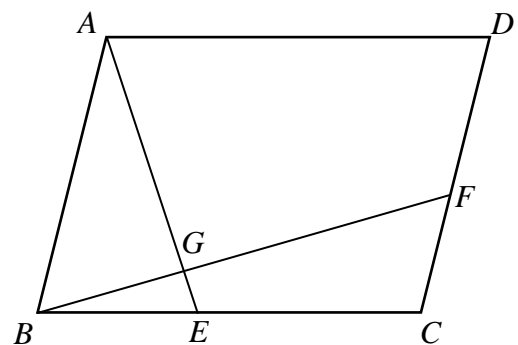
20. In the figure,  $ABCD$  is a semicircle. If  $\angle DAC = 34^\circ$  and  $\widehat{DC} : \widehat{CB} = 2 : 1$ , then  $\angle ADC =$

- A.  $107^\circ$ .
- B.  $112^\circ$ .
- C.  $124^\circ$ .
- D.  $129^\circ$ .



21. In the figure,  $ABCD$  is a parallelogram.  $E$  is a point lying on  $BC$  such that  $BE : EC = 2 : 3$ .  $F$  is a point lying on  $CD$  such that  $CF : FD = 3 : 5$ .  $AE$  and  $BF$  intersect at the point  $G$  such that  $EG : GA = 1 : 3$ . If the area of  $\triangle ABG$  is  $12 \text{ cm}^2$ , then the area of the quadrilateral  $CEGF$  is

- A.  $11 \text{ cm}^2$
- B.  $12 \text{ cm}^2$
- C.  $15 \text{ cm}^2$
- D.  $24 \text{ cm}^2$

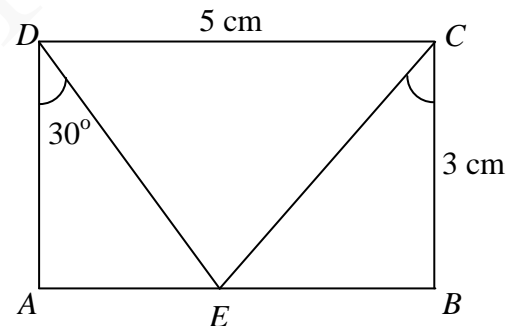


22. If an interior angle of a regular  $n$ -sided polygon is 8 times an exterior angle of the polygon, which of the following is/are true?

- I. The value of  $n$  is 18.
  - II. Each interior angle of the polygon is  $160^\circ$ .
  - III. The number of folds of rotational symmetry is 18.
- A. I and II only
  - B. I and III only
  - C. II and III only
  - D. I, II and III

23. In the figure,  $ABCD$  is a rectangle. If  $E$  is a point lying on  $AB$  such that  $\angle ADE = 30^\circ$ , find  $\angle BCE$  correct to the nearest degree.

- A.  $33^\circ$
- B.  $43^\circ$
- C.  $47^\circ$
- D.  $57^\circ$



24. The straight line  $L$  is perpendicular to the straight line  $3x + 4y - 10 = 0$ . If the  $y$ -intercept of  $L$  is 6, then the equation of  $L$  is

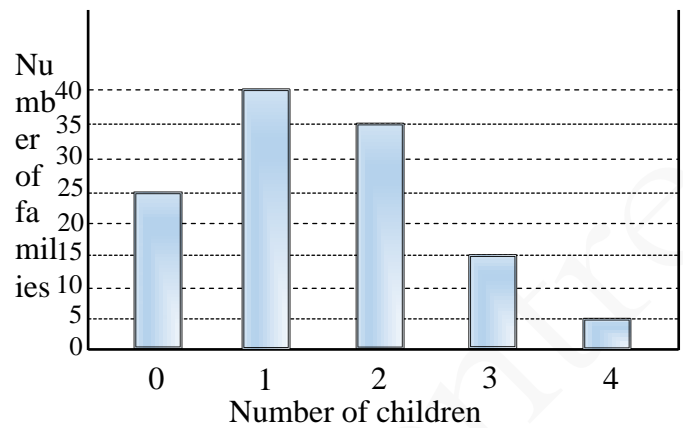
- A.  $3x + 4y + 18 = 0$ .
- B.  $3x + 4y - 24 = 0$ .
- C.  $4x - 3y + 18 = 0$ .
- D.  $4x - 3y - 24 = 0$ .



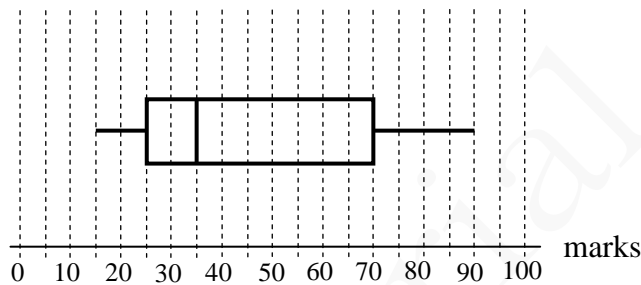
25. The rectangular coordinates of the point  $P$  are  $(-\sqrt{3}, 5)$ . If  $P$  is reflected with respect to the straight line  $y = 2$ , then the polar coordinates of its image are
- A.  $(2, 210^\circ)$ .
  - B.  $(2, 240^\circ)$ .
  - C.  $(4, 210^\circ)$ .
  - D.  $(4, 240^\circ)$ .
26. The equation of the circle  $C$  is  $3x^2 + 3y^2 - 18x - 24y + 10 = 0$ . Which of the following is true?
- A. The area of  $C$  is more than 40.
  - B. The coordinates of the centre of  $C$  are  $(9, 12)$ .
  - C. The origin lies inside  $C$ .
  - D.  $C$  does not cut the  $x$ -axis.
27. If a diameter of the circle  $x^2 + y^2 + kx - 14y + 45 = 0$  passes through the points  $(-3, 9)$  and  $(5, 5)$ , then  $k =$
- A.  $-5$ .
  - B.  $-2$ .
  - C.  $1$ .
  - D.  $7$ .

28. The bar chart below shows the distribution of the number of children in some families of a building. If a family is randomly selected from the families, find the probability that the selected family has more than one child.

- A.  $\frac{11}{24}$   
 B.  $\frac{19}{24}$   
 C.  $\frac{3}{5}$   
 D.  $\frac{9}{10}$



29. The box-and-whisker diagram below shows the distribution of the marks of a test got by a class of students. Find the inter-quartile range of the distribution.

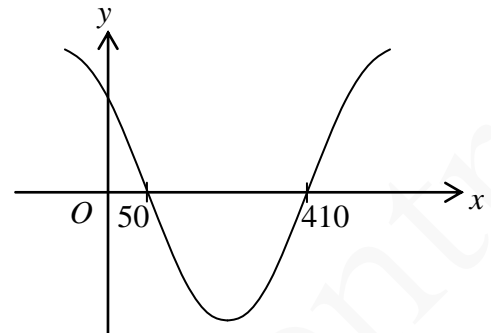


- A. 15  
 B. 25  
 C. 35  
 D. 45
30. Consider the following positive integers:
- 2            4            5            8            9            10            11             $m$              $n$
- Let  $a$ ,  $b$  and  $c$  be the mode, the median and the range of the above positive integers respectively. If the mean of the above positive integers is 6, which of the following must be true?
- I.  $a = 4$   
 II.  $b = 5$   
 III.  $c = 9$
- A. I only  
 B. II only  
 C. I and II only  
 D. II and III only

## Section B

31. Let  $k$  be a positive constant and  $-90^\circ < \theta < 90^\circ$ . If the figure shows the graph of  $y = \cos(kx^\circ + \theta)$ , then

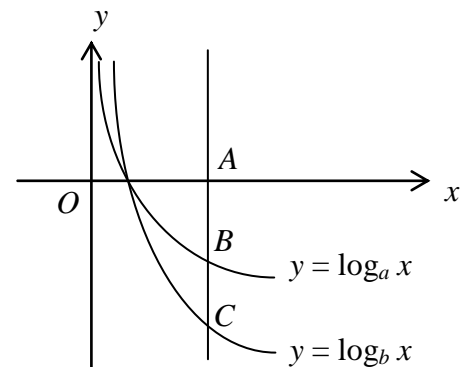
- A.  $k = 2, \theta = 65^\circ$ .  
 B.  $k = 2, \theta = -65^\circ$ .  
 C.  $k = \frac{1}{2}, \theta = 65^\circ$ .  
 D.  $k = \frac{1}{2}, \theta = -65^\circ$ .



32. The figure shows the graph of  $y = \log_a x$  and the graph of  $y = \log_b x$  on the same rectangular coordinate system where  $a$  and  $b$  are positive constants. If a vertical line cuts the  $x$ -axis, the graph of  $y = \log_a x$  and the graph of  $y = \log_b x$  at the points  $A, B$  and  $C$  respectively, which of the following is/are true?

- I.  $b > 1$   
 II.  $a < b$   
 III.  $\frac{AB}{AC} = \log_b a$

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

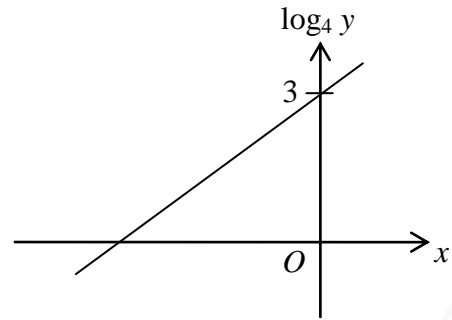


33.  $8^5 + 8^{21} =$

- A.  $100000000000100_{16}$ .  
 B.  $800000000000800_{16}$ .  
 C.  $1000000000001000_{16}$ .  
 D.  $8000000000008000_{16}$ .

34. The graph in the figure shows the linear relation between  $\log_4 y$  and  $x$ . If  $y = mn^x$ , then  $m =$

- A. 3.
- B. 4.
- C. 12.
- D. 64.



35. Consider the following system of inequalities:

$$\begin{cases} y + 10 \geq 0 \\ 3x - 5y \geq 0 \\ 4x - y - 34 \leq 0 \\ x + y + 16 \geq 0 \end{cases}$$

Let  $R$  be the region which represents the solution of the above system of inequalities. If  $(x, y)$  is a point lying in  $R$ , then the greatest value of  $6x - 5y + 60$  is

- A. 30.
- B. 126.
- C. 146.
- D. 150.

36. The sum of the 3<sup>rd</sup> term and the 7<sup>th</sup> term of a geometric sequence is 246 while the sum of the 5<sup>th</sup> term and the 9<sup>th</sup> term of the sequence is 2 214. Find the 13<sup>th</sup> term of the sequence.

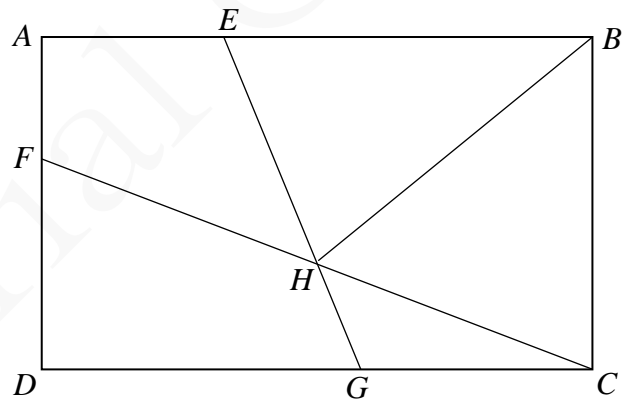
- A. 19 683
- B. 59 049
- C. 177 147
- D. 531 441

37. If  $k$  is a real number, then  $5k - \frac{4+ki}{i} =$

- A.  $4k + 4i$ .
- B.  $4k - 4i$ .
- C.  $6k + 4i$ .
- D.  $6k - 4i$ .

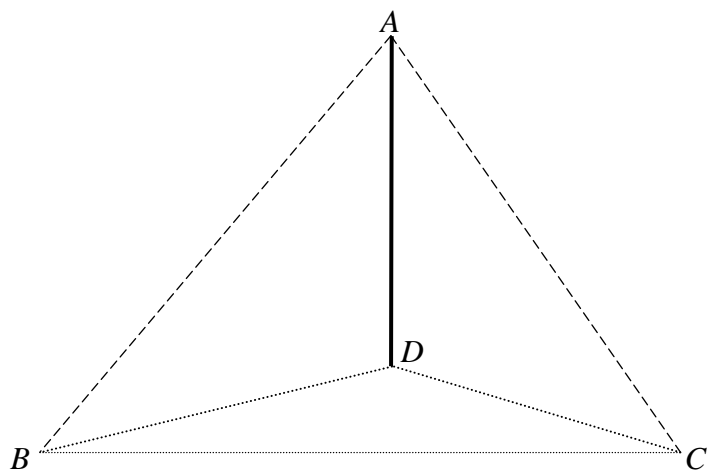
38. The figure shows the rectangle  $ABCD$  where  $AB = 1000$  cm and  $BC = 603$  cm. Let  $E$ ,  $F$  and  $G$  be points lying on  $AB$ ,  $AD$  and  $CD$  respectively such that  $AE = 320$  cm  $AF = 315$  cm and  $CG = 400$  cm. Denote the point of intersection of  $CF$  and  $EG$  by  $H$ . Find  $BH$  correct to the nearest cm.

- A. 658 cm
- B. 659 cm
- C. 660 cm
- D. 661 cm



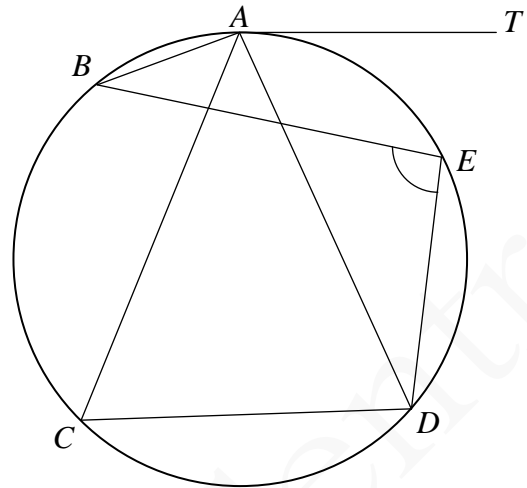
39. In the figure,  $AD$  is a vertical pole standing on a horizontal ground  $BCD$ . If  $AD = 12$  cm,  $AC = 20$  cm,  $BC = 34$  cm and  $BD = 30$  cm, find the angle between  $AC$  and the plane  $ABD$  correct to the nearest degree.

- A.  $22^\circ$
- B.  $37^\circ$
- C.  $53^\circ$
- D.  $68^\circ$



40. In the figure,  $TA$  is a tangent to the circle  $ABCDE$  at the point  $A$ . If  $\angle DAT = 50^\circ$ ,  $\angle ADC = 64^\circ$  and  $\angle BAC = 18^\circ$ , then  $\angle BED =$

- A.  $66^\circ$ .  
 B.  $84^\circ$ .  
 C.  $98^\circ$ .  
 D.  $102^\circ$



41. Let  $O$  be the origin. The coordinates of the points  $P$  and  $Q$  are  $(p, 0)$  and  $(0, q)$  respectively, where  $p$  and  $q$  are positive numbers. If the circumcentre of  $\triangle OPQ$  lies on the straight line  $2x + 3y = 3p$ , then  $p : q =$

- A.  $2 : 3$ .  
 B.  $3 : 4$   
 C.  $3 : 5$   
 D.  $4 : 3$

42. 0, 2, 4, 6 and 8 are known as even digits while 1, 3, 5, 7 and 9 are known as odd digits. The first digit of an eight-digit phone number is either 6 or 9. If the remaining digits are formed by a permutation of all digits (including 6 and 9), how many different eight-digit phone numbers with at least 3 even digits can be formed?

- A. 1 108 800  
 B. 1 159 200  
 C. 1 209 600  
 D. 20 000 000

43. There are four questions in quiz. The probabilities that Peter answers the questions correctly are  $\frac{1}{2}$ ,  $\frac{1}{4}$ ,  $\frac{1}{6}$  and  $\frac{1}{8}$  respectively. The probability that Peter answers at most 3 questions correctly in the quiz is
- A.  $\frac{1}{384}$  .  
B.  $\frac{1}{24}$  .  
C.  $\frac{367}{384}$  .  
D.  $\frac{383}{384}$  .
44. In an examination, the mean score of the examination is 65 marks. A girl gets 33 marks and her standard score is  $-4$ . If the standard score of a boy in the examination is 3, then his examination score is
- A. 8 marks.  
B. 78 marks.  
C. 89 marks.  
D. 97 marks.
45. If the variance of the four numbers  $x_1$ ,  $x_2$ ,  $x_3$ , and  $x_4$  is 18, then the variance of the four numbers  $4x_1 + 5$ ,  $4x_2 + 5$ ,  $4x_3 + 5$  and  $4x_4 + 5$  is
- A. 72.  
B. 77.  
C. 288.  
D. 293.

**END OF PAPER**