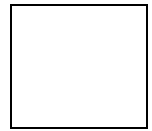




HKUGA College  
MOCK EXAMINATION(2021/2022)  
Mathematics Compulsory Part  
Paper 2  
Question Paper



TOTAL MARKS: 45

Time allowed: 1 hour 15 minutes Form: 6

Name: \_\_\_\_\_ Class (No.): \_\_\_\_\_ ( )

Teacher: CC / HC / JY / MS / MY / SKC / WC

---

### INSTRUCTIONS

1. This paper consists of 16 pages including this cover page. The words “**END OF PAPER**” should appear on the last page.
2. Do not open this exam paper until instructed to do so.
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 MC 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.
7. The use of an HKEAA-approved calculator is permitted.

**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.  $\frac{2^{111} \times 4^{222}}{8^{333}} =$

- A. 1.
- B.  $\frac{1}{2^{444}}$ .
- C.  $2^{444}$ .
- D. 0.

2.  $3ab + ac - ad - 21b - 7c + 7d =$

- A.  $(a + 7)(3b - c + d)$ .
- B.  $(a - 7)(3b - c + d)$ .
- C.  $(a + 7)(3b + c - d)$ .
- D.  $(a - 7)(3b + c - d)$ .

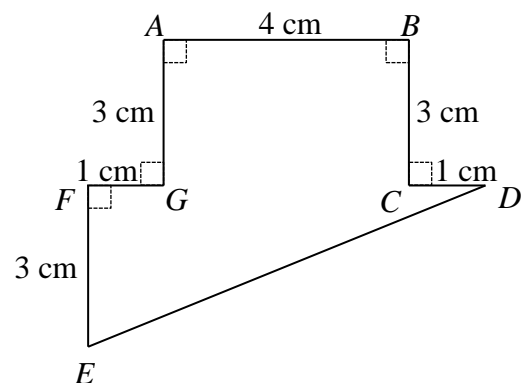
3.  $\frac{1}{4k + 5} - \frac{5}{4k - 5} =$

- A.  $\frac{-16k - 30}{16k^2 - 25}$ .
- B.  $\frac{8k}{16k^2 - 25}$ .
- C.  $\frac{-10}{16k^2 - 25}$ .
- D.  $\frac{16k + 20}{16k^2 - 25}$ .

4. If  $a$ ,  $b$  and  $c$  are non-zero constants such that  $a(2x-1)+b(x+2)\equiv c(x+1)$ , then  $a:b=$
- A.  $1:3$ .
  - B.  $1:4$ .
  - C.  $3:1$ .
  - D.  $4:1$ .
5. If  $f(2x+1)=\frac{1}{2x}$ , then  $f(x-1)=$
- A.  $\frac{1}{x-2}$ .
  - B.  $\frac{1}{x-1}$ .
  - C.  $\frac{1}{2x-2}$ .
  - D.  $\frac{1}{2x-1}$ .
6. The solution of  $8x+2 > 2(x-2)$  or  $9-2x \geq 5$  is
- A.  $x \geq 2$ .
  - B.  $x > -1$ .
  - C.  $-1 < x \leq 2$ .
  - D. all real numbers.
7. Betty sells two watches for \$4500 each. She gains 12.5% on one and loses 10% on the other. After the two transactions, Betty
- A. loses \$112.5.
  - B. gains \$112.5.
  - C. gains \$225.
  - D. has no gain and no loss.

8. A sum of \$85 000 is deposited at an interest rate of 8% per annum for 10 years, compounded quarterly. Find the interest correct to the nearest dollar.
- A. \$98 509  
 B. \$102 683  
 C. \$103 669  
 D. \$187 683
9. Let  $a_n$  be the  $n$ th term of a sequence. If  $a_3 = 11$ ,  $a_6 = 47$  and  $a_{n+2} = a_n + a_{n+1}$  for any positive integer  $n$ , then  $a_1 =$
- A. 4.  
 B. 7.  
 C. 18.  
 D. 29.
10. Let  $p(x)$  be a polynomial. When  $p(x)$  is divided by  $2x + 1$ , the remainder is 2. If  $p(x)$  is divisible by  $1 - 2x$ , find the remainder when  $p(x)$  is divided by  $4x^2 - 1$ .
- A.  $2x + 1$   
 B.  $2x - 1$   
 C.  $-2x + 1$   
 D.  $-2x - 1$

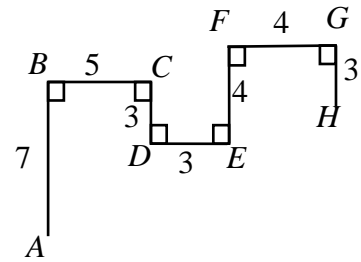
11. In the figure,  $ABCDEFG$  is a 7-sided polygon, where all the measurements are correct to the nearest cm. Let  $x \text{ cm}^2$  be the actual area of the polygon. Find the range of values of  $x$ .



- A.  $6.375 < x < 36.875$   
 B.  $11.5 < x < 29$   
 C.  $15.625 \leq x < 27.125$   
 D.  $14.375 \leq x < 28.875$

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

- A. 12.
- B. 13.
- C. 17.
- D. 29.



13. If  $w$  varies directly as the square root of  $x$  and inversely as the cube of  $y$ , which of the following must be constant?

- I.  $\frac{x}{w^2 y^6}$
- II.  $\frac{wy^3}{x^2}$
- III.  $\frac{wy^3}{\sqrt{x}} + 2021$

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

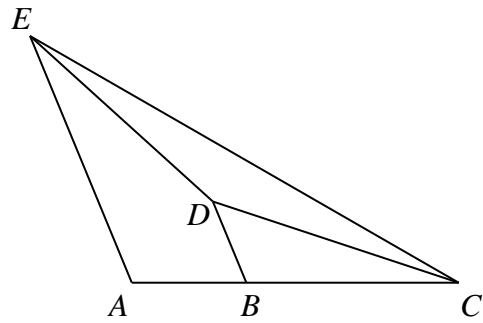
14. Which of the following statements about the graph of  $y = (-x + 1)^2 - 2$  is/are true?

- I. The graph opens downwards.
- II. The  $y$ -intercept is  $-2$ .
- III. The graph passes through the point  $(4, 7)$ .

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

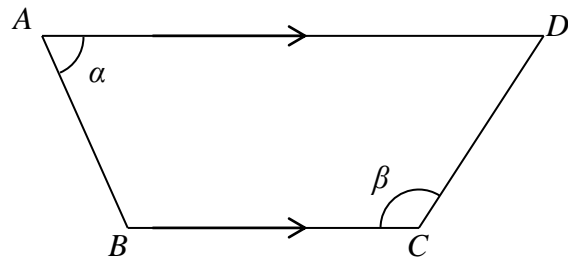
15. In the figure,  $B$  is a point lying on  $AC$  such that  $2AB = BC$ . It is given that  $AE \parallel BD$  and  $AE : BD = 3 : 1$ . If the area of  $\triangle CDE$  is  $24 \text{ cm}^2$ , then the area of the trapezium  $ABDE$  is

- A.  $12 \text{ cm}^2$ .  
 B.  $20 \text{ cm}^2$ .  
 C.  $32 \text{ cm}^2$ .  
 D.  $52 \text{ cm}^2$ .



16. In the figure,  $CD =$

- A.  $\frac{AB \sin \alpha}{\sin \beta}$ .  
 B.  $\frac{AB \sin \beta}{\sin \alpha}$ .  
 C.  $-\frac{AB \sin \alpha}{\sin \beta}$ .  
 D.  $\frac{AB \cos \beta}{\sin \alpha}$ .



17.  $[\sin(270^\circ + \theta) + 1][\cos(180^\circ - \theta) - 1] =$

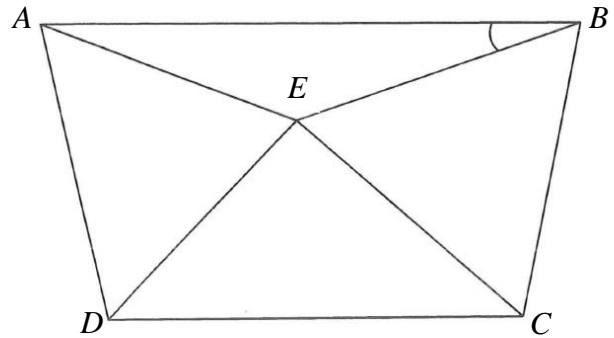
- A.  $\sin^2 \theta$ .  
 B.  $-\sin^2 \theta$ .  
 C.  $\cos^2 \theta$ .  
 D.  $-\cos^2 \theta$ .

18. The sum of the volumes of two solid spheres is  $2340\pi \text{ cm}^3$ . If the ratio of the radius of the larger sphere to the radius of the smaller sphere is  $4 : 1$ , then the sum of the surface areas of the two spheres is

- A.  $153\pi \text{ cm}^2$ .  
 B.  $306\pi \text{ cm}^2$ .  
 C.  $576\pi \text{ cm}^2$ .  
 D.  $612\pi \text{ cm}^2$ .

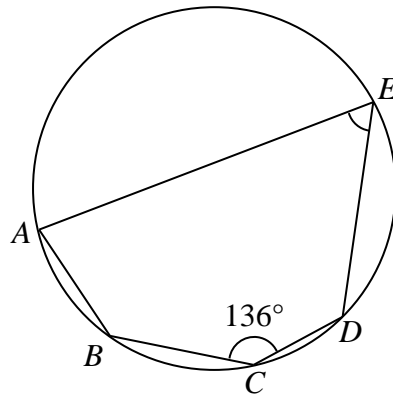
19. In the figure,  $BCE$  is an equilateral triangle and  $ADE$  is an isosceles triangle with  $AE = ED$ . If  $\angle DAE = 56^\circ$  and  $\angle EDC = \angle ECD = 41^\circ$ , then  $\angle ABE =$

- A.  $17^\circ$ .
- B.  $19^\circ$ .
- C.  $21^\circ$ .
- D.  $23^\circ$ .



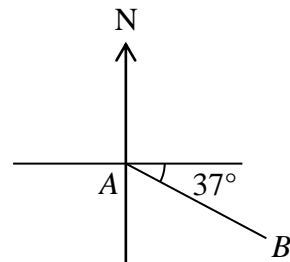
20. In the figure,  $ABCDE$  is a circle. If  $AB = BC = CD$  and  $\angle BCD = 136^\circ$ , then  $\angle AED =$

- A.  $44^\circ$ .
- B.  $66^\circ$ .
- C.  $68^\circ$ .
- D.  $72^\circ$ .



21. In the figure, the bearing of  $A$  from  $B$  is

- A.  $N 37^\circ W$ .
- B.  $N 53^\circ W$ .
- C.  $S 37^\circ E$ .
- D.  $S 53^\circ E$ .



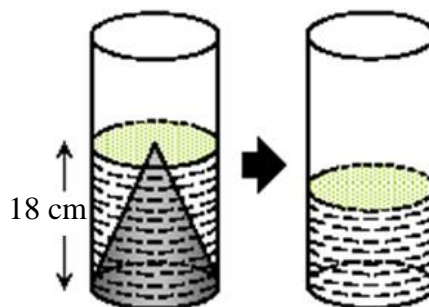
22. If the interior angle of a regular  $n$ -sided polygon is greater than the exterior angle by  $160^\circ$ , which of the following are true?

- I. The value of  $n$  is 18.
- II. Each exterior angle is  $10^\circ$ .
- III. The number of axes of reflectional symmetry of the polygon is 36.

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

23. In the figure, a solid right circular cone of height of 18 cm is put into a cylinder which has the same internal radius as the base radius of the cone. Water is then poured into the cylinder until water level just reaches the tip of the cone. If the cone is removed, what is the height of water in the cylinder?

- A. 6 cm
- B. 9 cm
- C. 12 cm
- D. 15 cm



24. A point  $A$  is rotated anticlockwise about the origin through  $270^\circ$  to the point  $B$ .  $B$  is then translated upwards by 3 units to the point  $C$ . If the coordinates of  $C$  are  $(7, -2)$ , find the  $y$ -coordinate of  $A$ .

- A.  $-7$
- B.  $5$
- C.  $7$
- D.  $9$

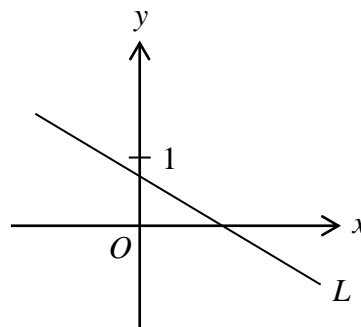


25.  $A$  and  $B$  are two fixed points in the rectangular coordinate plane. If  $P$  is a moving point such that  $PA$  is perpendicular to  $PB$ , then the locus of  $P$  is a

- A. circle.
- B. straight line.
- C. parabola.
- D. triangle.

26. In the figure, the equation of the straight line  $L$  is  $x - ay - b = 0$ . Which of the following must be true?

- I.  $a < 0$
- II.  $b < 0$
- III.  $a + b > 0$



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

27. The equations of the straight line  $L$  and the circle  $C$  are  $kx - 5y + k = 0$  and  $2x^2 + 2y^2 - 8x - 12y + 15 = 0$  respectively, where  $k$  is a constant. If  $L$  divides  $C$  into two equal parts, find the  $y$ -intercept of  $L$ .

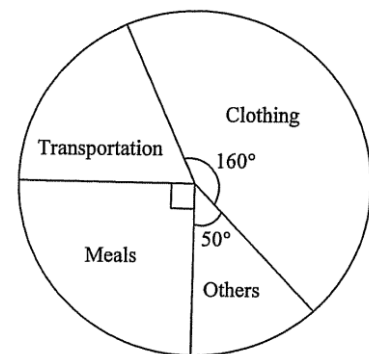
- A. 5
- B.  $\frac{6}{5}$
- C. 1
- D. -1

28. A box contains 4 blue balls and 3 red balls. If two balls are randomly drawn from the box one by one with replacement, then the probability of drawing one red ball and one blue ball is

- A.  $\frac{2}{7}$ .
- B.  $\frac{12}{49}$ .
- C.  $\frac{4}{7}$ .
- D.  $\frac{24}{49}$ .

29. The pie chart below shows the expenditure of Ian in a certain month. Ian spends \$900 on transportation that month. Find his expenditure on clothing that month.

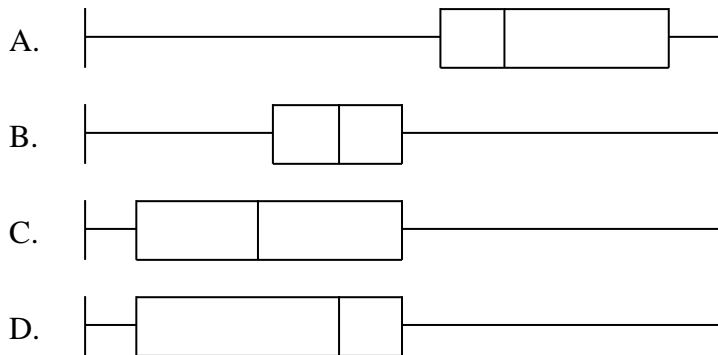
- A. \$1350
- B. \$1800
- C. \$2400
- D. \$5400



30. The stem-and-leaf diagram below shows the distribution of the daily salaries (in \$100) of some employees of a company.

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

Which of the following box-and-whisker diagrams may represent the distribution of their daily salaries?



**Section B**

31.  $300ACE0_{16} =$

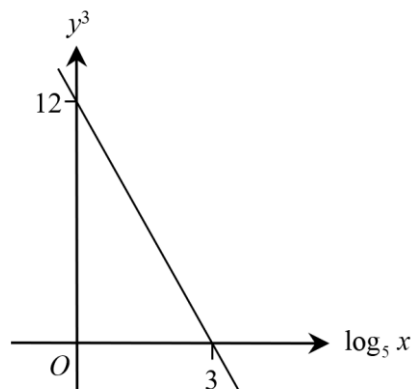
- A.  $3 \times 16^6 + 10 \times 16^3 + 12 \times 16^2 + 14 \times 16.$
- B.  $3 \times 16^6 + 11 \times 16^3 + 13 \times 16^2 + 15 \times 16.$
- C.  $3 \times 16^7 + 10 \times 16^4 + 12 \times 16^3 + 14 \times 16^2.$
- D.  $3 \times 16^7 + 11 \times 16^4 + 13 \times 16^3 + 14 \times 16^2.$

32. Let  $k$  be a constant. Find the values of  $k$  such that  $x^2 + (k-1)x + 9 > 0$  for any real number  $x$ .

- A.  $-5 < k < 7$
- B.  $-7 < k < 5$
- C.  $k < -5$  or  $k > 7$
- D.  $k < -7$  or  $k > 5$

33. The graph in the figure shows the linear relation between  $\log_5 x$  and  $y^3$ . If  $x = 5$ , then  $y =$

- A. 2.
- B. 8.
- C. -2.
- D. -8.



34. If  $a$  is a real number and  $n$  is an integer, then the real part of  $\frac{ai^{4n+1} - 2i^{4n+2}}{ai^{4n+3} + 2i^{4n}}$  is

- A. 1.
- B.  $\frac{4a}{4+a^2}$ .
- C.  $\frac{4-a^2}{4+a^2}$ .
- D.  $\frac{4+a^2}{4-a^2}$ .

35. Consider the following system of inequalities:

$$\begin{cases} x - 3y + 18 \geq 0 \\ 2x + y + 1 \leq 0 \\ -1 \leq y \leq 3 \end{cases}$$

Let  $R$  be the region which represents the solution of the above system of inequalities. Find the constant  $k$  such that the minimum value of  $2x + 3y + k$  is 7, where  $(x, y)$  is a point lying in  $R$ .

- A. 2
- B. 10
- C. 16
- D. 52

36. If  $a, b, c, d$  is an arithmetic sequence, which of the following must be true?

- I.  $ad = bc$
- II.  $a + d = b + c$
- III.  $a < b < c < d$

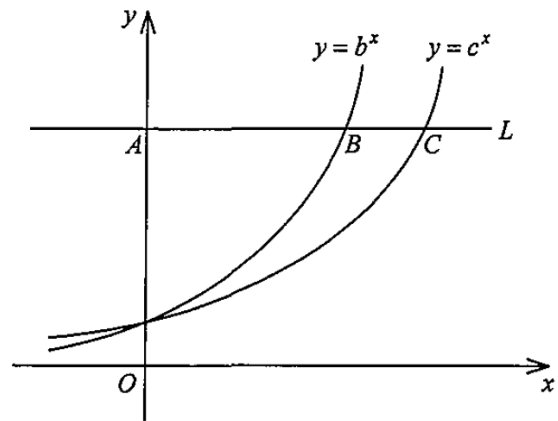
- A. I only
- B. II only
- C. I and III only
- D. II and III only

37. For  $0^\circ \leq x < 360^\circ$ , how many roots does the equation  $7 \cos x \sin x = 8 \sin x$  have?

- A. 0
- B. 2
- C. 4
- D. 5

38. The figure shows the graph of  $y = b^x$  and the graph of  $y = c^x$  on the same rectangular coordinate system, where  $b$  and  $c$  are positive constants. If a horizontal line  $L$  cuts the  $y$ -axis, the graph of  $y = b^x$  and the graph of  $y = c^x$  at  $A$ ,  $B$  and  $C$  respectively, which of the following must be true?

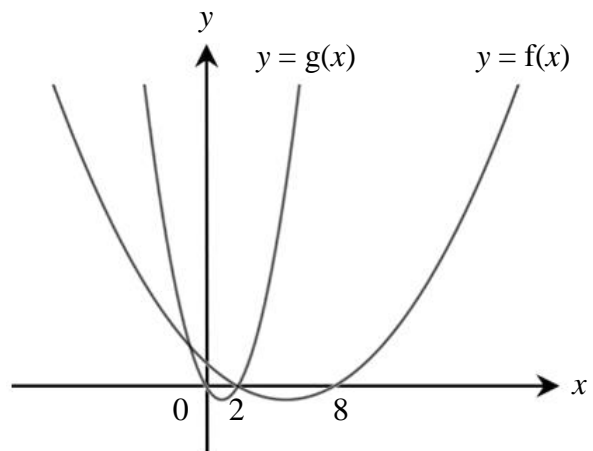
- I.  $b > c$
- II.  $\frac{AC}{AB} = \log_b c$
- III.  $0 < \frac{1}{bc} < 1$



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

39. If the figure below shows the graphs of  $y = f(x)$  and  $y = g(x)$  on the same coordinate system, then

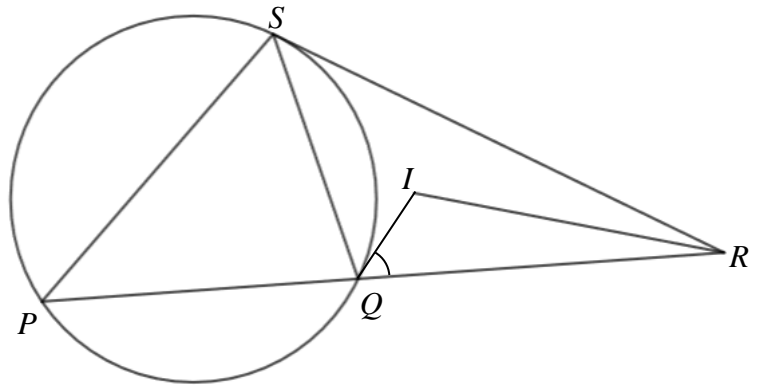
- A.  $g(x) = f(3x + 2)$ .
- B.  $g(x) = f\left(\frac{x}{3} + 2\right)$ .
- C.  $g(x) = f(3x + 6)$ .
- D.  $g(x) = \frac{1}{3}f(x - 2)$ .



40. In the figure,  $PQS$  is a circle.  $PQ$  is produced to  $R$  such that  $RS$  is the tangent to the circle at  $S$ .

$I$  is the in-centre of  $\triangle QRS$ . If  $3\widehat{PQ} = 4\widehat{QS}$  and  $\angle SPQ = 3\angle IRQ$ , then  $\angle IQR =$

- A.  $15^\circ$ .
- B.  $45^\circ$ .
- C.  $52.5^\circ$ .
- D.  $60^\circ$ .



41. If the straight line  $2x - y + k = 0$  and the circle  $x^2 + y^2 - 4x + 2y - 1 = 0$  intersect at  $A$  and  $B$ , then the  $x$ -coordinate of the mid-point of  $AB$  is

- A.  $\frac{4k}{5}$ .
- B.  $-\frac{4k}{5}$ .
- C.  $\frac{2k}{5}$ .
- D.  $-\frac{2k}{5}$ .

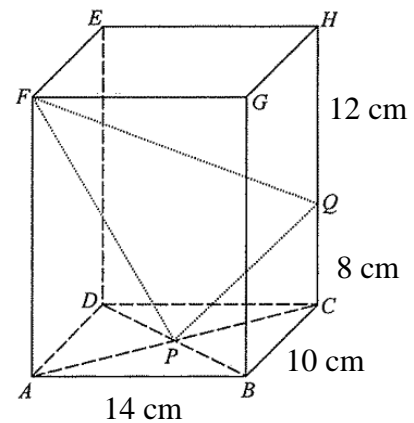
42. If  $\triangle ABC$  is an obtuse-angled triangle, which of the following must lie inside  $\triangle ABC$ ?

- I. The circumcenter of  $\triangle ABC$
- II. The in-centre of  $\triangle ABC$
- III. The centroid of  $\triangle ABC$

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

43. In the figure,  $ABCDEFGH$  is a rectangular block.  $AC$  and  $BD$  intersect at  $P$ .  $Q$  is a point lying on  $CH$  such that  $CQ = 8$  cm and  $QH = 12$  cm. Find  $\angle FPQ$  correct to the nearest  $0.1^\circ$ .

- A.  $31.8^\circ$   
 B.  $70.4^\circ$   
 C.  $77.8^\circ$   
 D.  $88.2^\circ$



44. Peter selected 3 different numbers from 1 to 1000 inclusive. Find the probability that the selected numbers can form an arithmetic sequence.

- A.  $\frac{1}{3}$   
 B.  $\frac{1}{666}$   
 C.  $\frac{1}{999}$   
 D.  $\frac{1}{3996}$

45. Let  $m_1$ ,  $r_1$  and  $v_1$  be the mean, the range and the variance of the group of numbers  $\{a_1, a_2, a_3, \dots, a_{100}\}$  respectively while  $m_2$ ,  $r_2$  and  $v_2$  be the mean, the range and the variance of the group of numbers  $\{3a_1 + 2, 3a_2 + 2, 3a_3 + 2, \dots, 3a_{100} + 2\}$ . Which of the following must be true?

- I.  $m_2 = 3m_1 + 2$   
 II.  $r_2 = 3r_1$   
 III.  $v_2 = 3v_1$

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

**END OF PAPER**