# MOCK EXAM 9

# 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. $(a + b)(a^2 – ab – b^2) =$

   A. $(a + b)^3$.

   B. $a^3 + b^3$.

   C. $a^2 – 2ab^2 – b^3$.

   D. $a^3 – 2a^2b – 2ab^2 – b^3$.

2. $\dfrac{2x^4}{(2x^2)^6} =$

   A. $\dfrac{1}{6x^2}$.

   B. $\dfrac{1}{6x^4}$.

   C. $\dfrac{1}{32x^3}$.

   D. $\dfrac{1}{32x^8}$.

3. If $8x – 3y = 14x + 6y = 60$, then $y =$

   A. $–6$ .

   B. $–4$.

   C. 4.

   D. 6.

4. If $p$ and $q$ are constants such that $x^2 – 2x + p \equiv (x – 3)(x + q) – 5$, then $p =$

   A. $–10$.

   B. $–8$.

   C. $–5$.

   D. 1.

.



 

5. If $a = 5 - \frac{6}{b-3}$, then $b =$

   A. $\frac{21-3a}{5-a}$.

   B. $\frac{21+3a}{5-a}$.

   C. $\frac{21-3a}{5+a}$.

   D. $\frac{21+3a}{5+a}$.

6. $\sqrt{2023}=$

   A. 44.97 (correct to 2 decimal places).

   B. 44.978 (correct to 3 significant figures).

   C. 44.977772 (correct to 6 significant figures).

   D. 44.9778 (correct to 4 decimal places).

7. The largest integer satisfying the compound inequality $-3(x + 8) - 2 > 16$ or $\frac{4x+1}{3} < 7$ is

   A. 5.

   B. 4.

   C. –2.

   D. –3.

8. Let $k$ be a constant. If $f(x) = x^3 - kx^2 + k$, then $f(k) + f(-k) =$

   A. 0.

   B. $2k$.

   C. $-2k^3 + 2k$.

   D. $2k^3 + 2k$.

9. Let $f(x) = x^{15} + 3x - k$, where $k$ is a constant. If $f(x)$ is divisible by $x + 1$, find the remainder when $f(x)$ is divided by $x - 1$.

   A. –4

   B. 0

   C. 6

   D. 8




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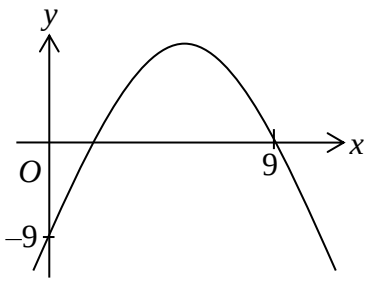
10. The figure shows the graph of $y = -x^2 + mx + n$, where $m$ and $n$ are constants. The equation of the axis of symmetry of the graph is




A. $x = 3$.

B. $x = 4$.

C. $x = 5$.

D. $x = 6$.

11. A sum of \$250 000 is deposited at an interest rate of 4% per annum for 5 years, compounded monthly. Find the amount correct to the nearest dollar.

A. \$305 249

B. \$305 047

C. \$304 163

D. \$300 000

12. If $a$, $b$ and $c$ are non-zero constants such that $x(x - 4a) - 2a \equiv x^2 - 3(bx + c)$, then $a : b : c =$

A. 3 : 4 : 1.

B. 3 : 4 : 2.

C. 4 : 3 : 6.

D. 6 : 3 : 4.

13. If $z$ varies directly as $x^2$ and inversely as $y$, which of the following must be a constant?

A. $\dfrac{x^2}{yz}$

B. $\dfrac{x^2y}{z}$

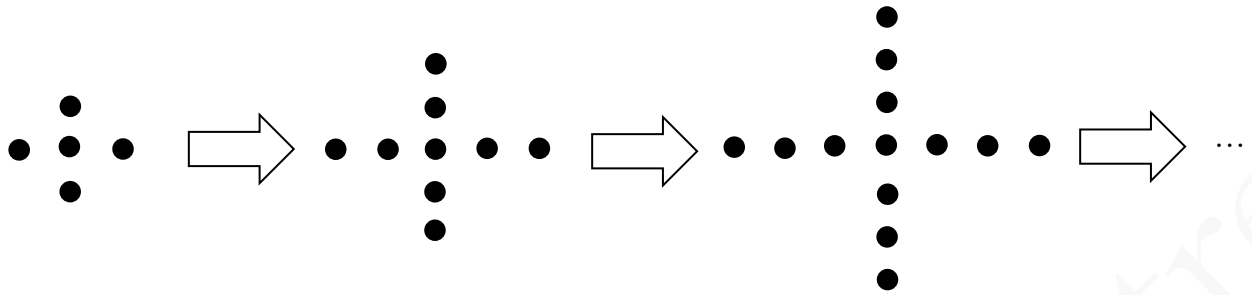
C. $\dfrac{x}{y^2z}$

D. $\dfrac{y}{x^2z}$



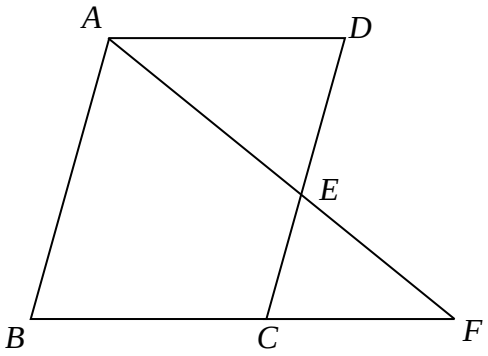
14. In the figure, the 1st pattern consists of 5 dots. For any positive integer $n$, the $(n + 1)$th pattern is formed by adding 4 dots to the $n$th pattern. Find the number of dots in the 10th pattern.



A. 33
B. 37
C. 41
D. 45

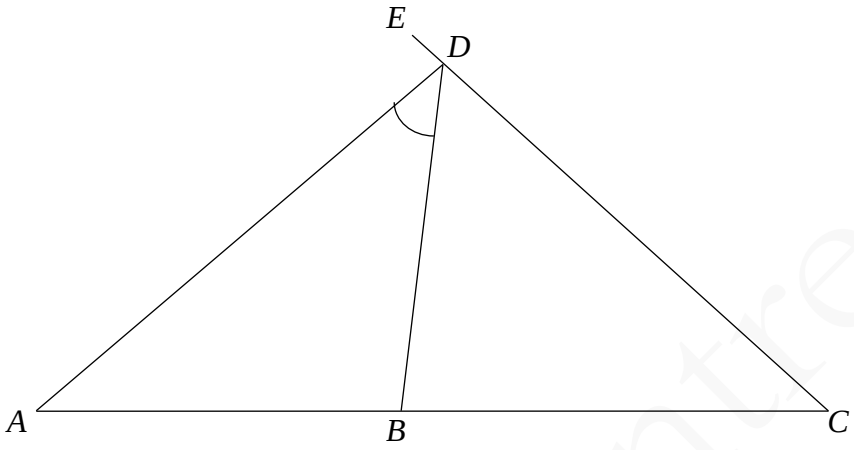
15. The base of a solid right pyramid is a rectangle with length 36 cm and width 14 cm. If the height of the pyramid is 24 cm, then the total surface area of the pyramid is
A. 600 $cm^2$.
B. 1080 $cm^2$.
C. 1320 $cm^2$.
D. 1824 $cm^2$.

16. In the figure, $ABCD$ is a parallelogram. $E$ is a point lying on $CD$ such that $DE : EC = 4 : 3$. $AE$ produced and BC produced meet at $F$. If the area of $\triangle CEF$ is 18 $cm^2$, then the area of the parallelogram $ABCD$ is
A. 72 $cm^2$.
B. 80 $cm^2$.
C. 98 $cm^2$.
D. 112 $cm^2$.



17. In the figure, *ABC* and *CDE* are straight lines. It is given that *BC* = *BD* and *AD* = *CD*. If $\angle ADE = 94^o$, then $\angle ADB =$

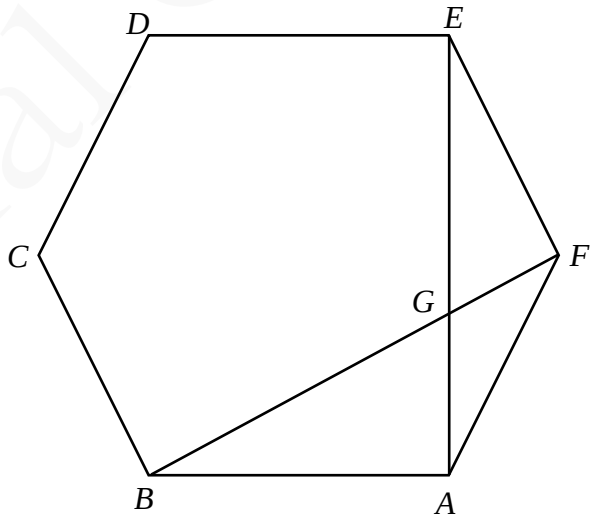
A. $39^o$
B. $41^o$
C. $44^o$
D. $47^o$




18. In the figure, *ABCDEF* is a regular hexagon. *AE* and *BF* intersect at the point *G*. Which of the following are true?

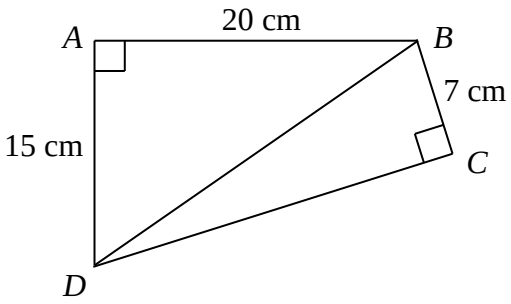
I. *AG* = *FG*
II. $\triangle ABG \cong \triangle FEG$
III. *BDEF* is a cyclic quadrilateral.

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




19. In the figure, the area of quadrilateral *ABCD* is

A. 234 $cm^2$.
B. 318 $cm^2$.
C. 384 $cm^2$.
D. 468 $cm^2$.

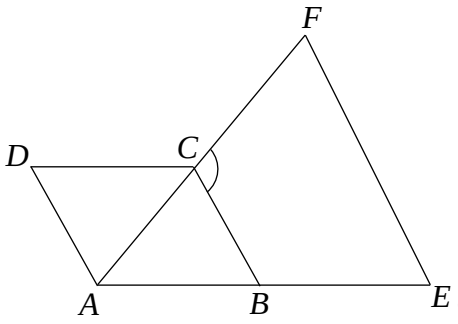




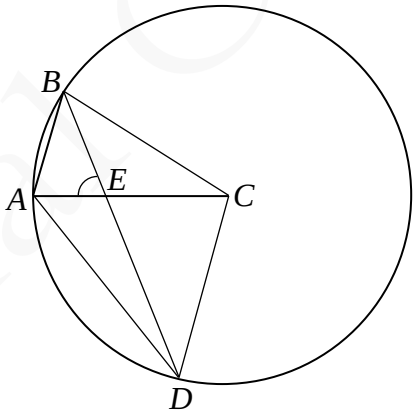
20. In the figure, *ABCD* is a rhombus. *ABE* and *ACF* are straight lines such that *AE* = *AF*. If $\angle BEF = 56^o$, then $\angle BCF =$

A. $136^o$.
B. $124^o$.
C. $112^o$.
D. $108^o$.



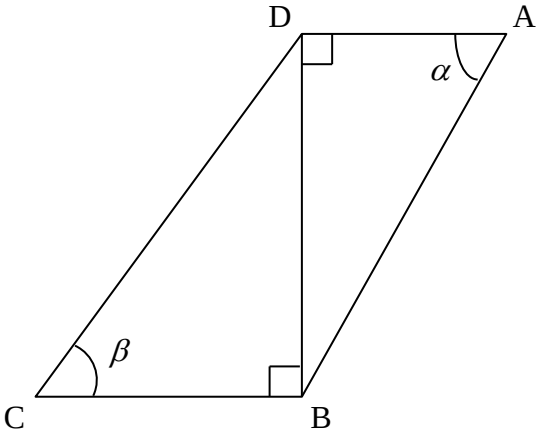

21. In the figure, *ABCD* is a trapezium. *C* is the centre of the circle *BAD*. *AC* and *BD* intersect at *E*. If $\angle BDC = 38^o$, then $\angle AEB =$

A. $57^o$.
B. $66^o$.
C. $71^o$.
D. $76^o$.




22. In the figure, $\frac{AB}{CD} =$

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





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23. In the figure, the equation of the straight line $L$ is $ax + by - 20 = 0$. Which of the following are true?

I. $a < b$

II. $a < -5$

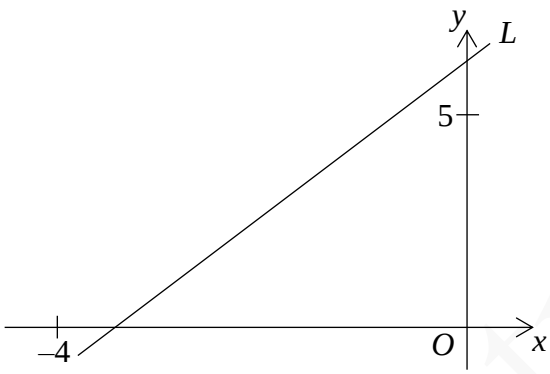
III. $b > 4$

A. I and II only

B. I and III only

C. II and III only

D. I, II and III




24. The coordinates of the points $A$ and $B$ are (1, 2) and (3, –2). Let $P$ be a moving point in the rectangular coordinate plane such that $AP = BP$. Find the equation of the locus of $P$.

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

B. $x - 2y + 10 = 0$

C. $x - 2y + 18 = 0$

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

25. The coordinates of the point $A$ are (3, –6). $A$ is reflected about the $y$-axis to the point $B$. $B$ is then rotated clockwise about the origin through $90^o$ to the point $C$. Find the $x$-coordinate of $C$.

A. 6

B. 3

C. –3

D. –6

26. The coordinates of the points $A$ and $B$ are (5, 2) and (8, 6) respectively. If $P$ is a moving point in the rectangular coordinate plane such that $\angle APB = 90^o$, then the locus of $P$ is

A. the angle bisector of $\angle AOB$, where $O$ is the origin.

B. the straight line which passes through $A$ and $B$.

C. the perpendicular bisector of $AB$.

D. the circle with $AB$ as a diameter.



27. The equation of the circle $C$ is $2x^2 + 2y^2 + 8x - 16y + 21 = 0$. Which of the following is/are true?

    I. The centre of $C$ lies in the fourth quadrant.

    II. The origin lies outside $C$.

    III. The area of $C$ is $299\pi$.

    A. I only

    B. II only

    C. I and III only

    D. II and III only

28. Two numbers are randomly drawn at the same time from ten balls numbered 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10 respectively. Find the probability that the product of the two numbers drawn is even.

    A. $\frac{2}{9}$

    B. $\frac{5}{9}$

    C. $\frac{7}{9}$

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

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

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

    Find the inter-quartile range of the distribution.

    A. 7.5

    B. 8

    C. 8.5

    D. 9





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30. The table below shows the distribution of the number of books read by some students in a year.

| Number of books read | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|
| Number of students | 19 | 18 | 22 | 10 | 6 |

Which of the following is true?

A. The median of the distribution is 11.

B. The mode of the distribution is 22.

C. The interquartile range is 2.

D. The lower quartile is 11.



 

**Section B**

32. It is given that $\log_8 y$ is a linear function of $\log_2 x$. The intercepts on the vertical axis and horizontal axis of the graph of the linear function are 5 and –4 respectively. Which of the following is true?

A. $\frac{x^{15}}{y^4} = 2^{60}$

B. $\frac{y^4}{x^{15}} = 2^{60}$

C. $x^4y^{15} = 2^{60}$

D. $x^{15}y^4 = 2^{60}$

32. If $x - \log y = x^2 - \log y^2 = -3$, then $y =$

A. –1 or 3.

B. 2 or 6.

C. $\frac{1}{1000000}$ or $\frac{1}{100}$.

D. 100 or 1 000 000.

33. $10010001010001_2 =$

A. $2^{13} + 2^{10} + 81$.

B. $2^{13} + 2^{10} + 161$.

C. $2^{14} + 2^{11} + 81$.

D. $2^{14} + 2^{11} + 161$.

34. If $\beta$ is a real number, then the real part of $\frac{3-i^5}{\beta+2i} + i^8$ is

A. $\frac{3\beta-2}{\beta^2-4}$.

B. $\frac{3\beta-2}{\beta^2+4}$.

C. $\frac{\beta^2+3\beta+2}{\beta^2-4}$.

D. $\frac{\beta^2+3\beta+2}{\beta^2+4}$.



 

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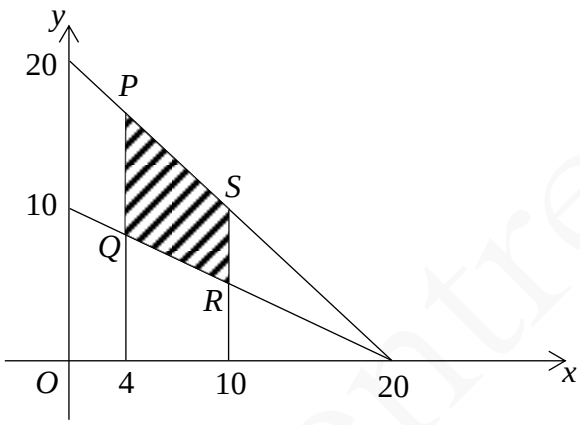
35. If the figure, $PQ$ and $SR$ are vertical lines. If $(x, y)$ is a point lying in the shaded region $PQRS$ (including the boundary), at which point does $9x - 5y + 4$ attain its greatest value?

A. $P$
B. $Q$
C. $R$
D. $S$




36. The nth term of a sequence is $3n - 28$. Which of the following is/are true?

I. $-16$ is a term of the sequence.
II. The sequence has 8 negative terms.
III. The sum of the first $n$ terms of the sequence is $\frac{3n^2 - 53n}{2}$.

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

37. Let $k$ be a constant. The straight line $x + 3y - 12 = 0$ and the circle $2x^2 + 2y^2 - 16x + ky + 64 = 0$ intersect at points $A$ and $B$. If the $y$-coordinate of the mid-point of $AB$ is 3, find $k$.

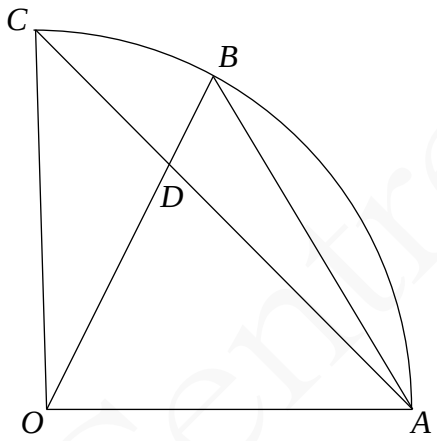
A. $-24$
B. 36
C. 156
D. 216



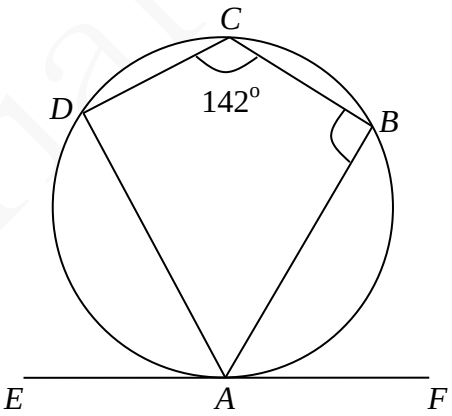
38. In the figure, $O$ is the centre of the sector $OABC$. It is given that $OAB$ is an equilateral triangle. $AC$ and $OB$ intersect at the point $D$. If $OC$ = 8 cm and $\angle AOC = 90^o$, find the area of $\Delta ABC$ correct to the nearest $cm^2$.

A. 12 $cm^2$
B. 16 $cm^2$
C. 17 $cm^2$
D. 28 $cm^2$



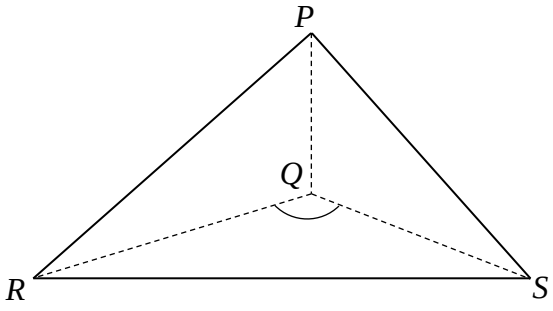

39. In the figure, $EF$ is the tangent to the circle at $A$. If $AB$ is the angle bisector of $\angle DAF$ and $CB = CD$, then $\angle ABC$ =

A. $142^o$.
B. $123^o$.
C. $114^o$.
D. $104^o$.




40. The figure shows a tetrahedron $PQRS$ with the base $QRS$ lying on the horizontal ground. It is given that $Q$ is vertically below $P$. If $\angle PRQ = 50^o$, $\angle PSQ = 66^o$ and $\angle RPS = 60^o$, find $\angle RQS$ correct to the nearest degree.

A. $120^o$
B. $130^o$
C. $140^o$
D. $150^o$







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41. If $\Delta ABC$ is a right-angled triangle with $\angle ABC = 90^{o}$, which of the following is/are true?

I. The circumcentre of $\Delta ABC$ lies on $AC$.

II. The centroid of $\Delta ABC$ lies outside $\Delta ABC$.

III. The in-centre of $\Delta ABC$ lies inside $\Delta ABC$.

A. I only

B. II only

C. I and III only

D. II and III only

42. There are 6 red balls and 8 blue balls in a bag. If 5 balls are randomly drawn from the bag, find the probability that at most 3 blue balls are drawn.

A. $\frac{10}{143}$

B. $\frac{34}{143}$

C. $\frac{109}{143}$

D. $\frac{133}{143}$

43. Bag A contains 4 red balls, 4 green balls and 3 blue balls while bag B contains 2 red balls, 5 green balls and 4 brown balls. If one ball is drawn from each bag, then the probability that the two balls drawn are of different colours is

A. $\frac{28}{121}$.

B. $\frac{40}{121}$.

C. $\frac{61}{121}$.

D. $\frac{93}{121}$.

 

44. In an examination, the mean score of the examination is 65 marks. The examination score of Jenny is 50 marks and her standard score is –2.5. If the examination score of Sue is 95, then her standard score is

    A. 4.5
    B. 5
    C. 6
    D. 6.5

45. The median, the interquartile range and the variance of a set of numbers are $m$, $r$ and $v$ respectively. Each number of the set is multiplied by $k$ and then 3 is subtracted from each resulting number to form a new set of numbers where $k$ is a positive number. Which of the following is/are true?

    I. The median of the new set of numbers is $km - 3$.
    II. The interquartile range of the new set of numbers is $kr - 3$.
    III. The variance of the new set of numbers is $kv - 3$.

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

**END OF PAPER**



 