HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY
HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2016

MATHEMATICS Compulsory Part
PAPER 2

11.30 am – 12.45 pm (1¼ hours)

INSTRUCTIONS

1. Read carefully the instructions on the Answer Sheet. After the announcement of the start of the examination, you should first stick a barcode label and insert the information required in the spaces provided. No extra time will be given for sticking on the barcode label after the 'Time is up' announcement.

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.

Not to be taken away before the end of the examination session

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. $8^{222} \cdot 5^{666} =$

   A. 10^{666}.

   B. 10^{888}.

   C. 40^{666}.

   D. 40^{888}.

2. If $\frac{a}{x}+\frac{b}{y}=3$, then $x=$

   A. $\frac{ay}{3y-b}$.

   B. $\frac{ay}{b-3y}$.

   C. $\frac{by}{3y-a}$.

   D. $\frac{by}{a-3y}$.

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

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

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

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

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

4. $0.0765403 =$

A. 0.076 (correct to 2 significant figures).

B. 0.0765 (correct to 3 decimal places).

C. 0.07654 (correct to 4 significant figures).

D. 0.076540 (correct to 5 decimal places).

5. If $4\alpha+\beta=7\alpha+3\beta=5$, then $\beta=$

A. -3.

B. -2.

C. 2.

D. 3.

6. Let $f(x)=4x^3+kx+3$, where k is a constant. If $f(x)$ is divisible by $2x+1$, find the remainder when $f(x)$ is divided by $x+1$.

A. -7

B. -6

C. 0

D. 5

7. The solution of $-5x>21-2x$ and $6x-18<0$ is

A. $x<-7$.

B. $x<3$.

C. $-7<x<3$.

D. $x<-7$ or $x>3$.

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8. If k is a constant such that the quadratic equation $x^2+kx+8k+36=0$ has equal roots, then $k=$

A. -6 .

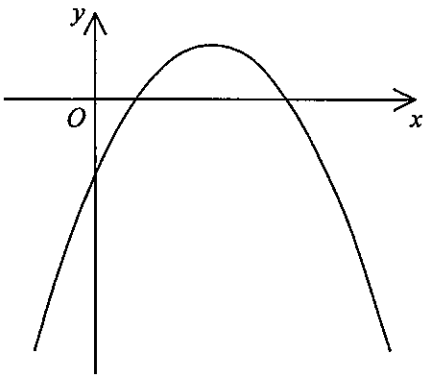
B. 12 .

C. -4 or 36 .

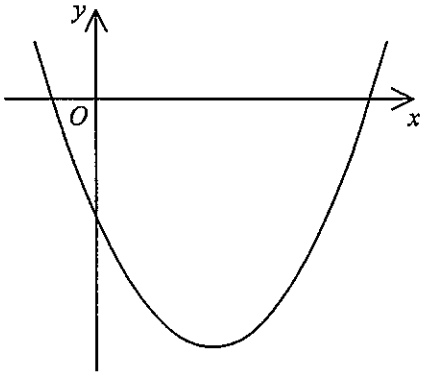
D. -18 or 2 .

9. If $-1<a<0$, which of the following may represent the graph of $y=(ax+1)^2+a$?

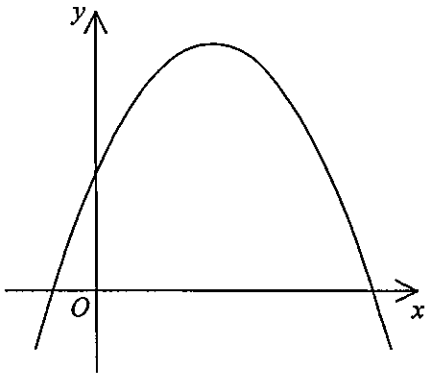
A.



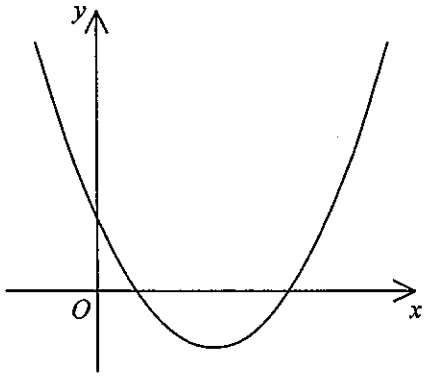
B.



C.



D.



10. The monthly salary of Donald is 25% higher than that of Peter while the monthly salary of Peter is 25% lower than that of Teresa. It is given that the monthly salary of Donald is \$33 360 . The monthly salary of Teresa is

A. \$31 275 .

B. \$33 360 .

C. \$35 584 .

D. \$52 125 .

11. If x and y are non-zero numbers such that $(3y-4x):(2x+y)=5:6$, then $x:y=$

A. $7:8$.

B. $8:29$.

C. $9:32$.

D. $13:34$.

12. It is given that z varies directly as $\sqrt{x}$ and inversely as y. If x is decreased by 36% and y is increased by 60%, then z

A. is increased by 24%.

B. is increased by 28%.

C. is decreased by 40%.

D. is decreased by 50%.

13. The cost of flour of brand X is $\$42/\text{kg}$. If $3\,\text{kg}$ of flour of brand X and $2\,\text{kg}$ of flour of brand Y are mixed so that the cost of the mixture is $\$36/\text{kg}$, find the cost of flour of brand Y.

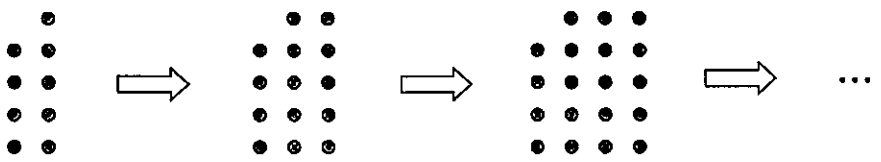
A. $\$27/\text{kg}$

B. $\$30/\text{kg}$

C. $\$32/\text{kg}$

D. $\$39/\text{kg}$

14. In the figure, the 1st pattern consists of 9 dots. For any positive integer n, the $(n+1)$ th pattern is formed by adding 5 dots to the nth pattern. Find the number of dots in the 7th pattern.



A. 29

B. 34

C. 39

D. 44

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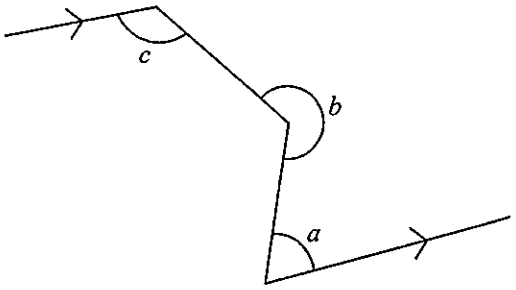
15. According to the figure, which of the following must be true?

I. $a+c=180°$
II. $a+b-c=180°$
III. $b+c=360°$



A. I only

B. II only

C. I and III only

D. II and III only

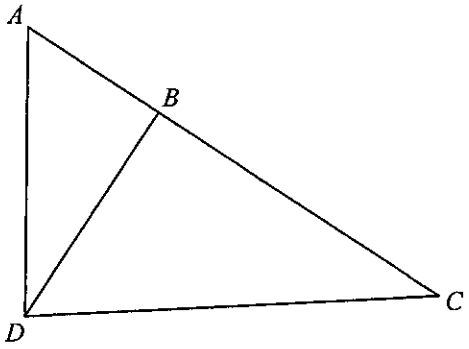
16. In the figure, ABC is a straight line. If $AB=24$ cm , $AD=40$ cm , $BD=32$ cm and $CD=68$ cm , then $BC=$

A. 43 cm .

B. 54 cm .

C. 55 cm .

D. 60 cm .



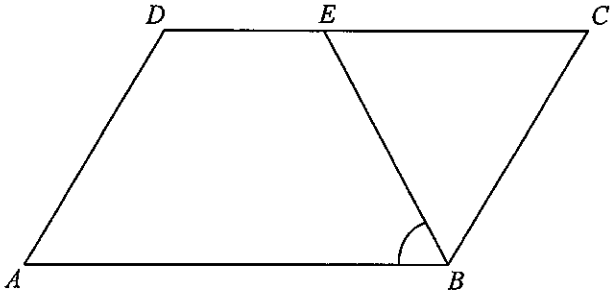
17. In the figure, $ABCD$ is a parallelogram. E is a point lying on CD such that $BE=CE$. If $\angle ADC=114°$, then $\angle ABE=$

A. 48° .

B. 57° .

C. 62° .

D. 66° .



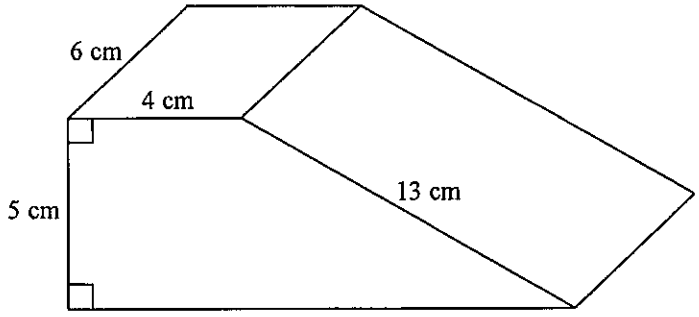
18. The figure shows a right prism. Find the volume of the prism.

A. $216\ \text{cm}^3$

B. $240\ \text{cm}^3$

C. $300\ \text{cm}^3$

D. $328\ \text{cm}^3$



19. In the figure, OAB and OCD are sectors with centre O, where $OA = 33$ cm and $OC = 39$ cm. The area of the shaded region $ABDC$ is $72\pi\ \text{cm}^2$. Which of the following is/are true?

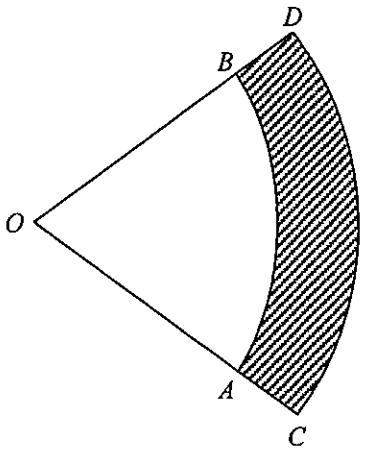
I. The angle of the sector OAB is $60°$.
II. The area of the sector OAB is $11\pi\ \text{cm}^2$.
III. The perimeter of the sector OCD is 13π cm.

A. I only

B. II only

C. I and III only

D. II and III only



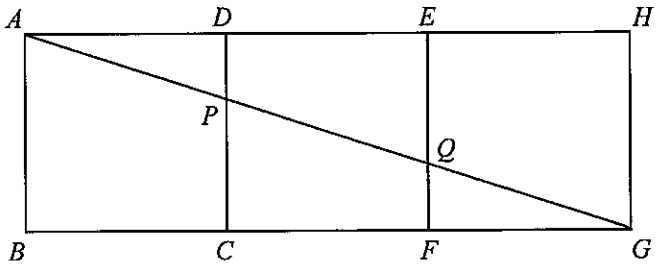
20. In the figure, $ABCD$, $CDEF$ and $EFGH$ are squares. AG cuts CD and EF at P and Q respectively. Find the ratio of the area of quadrilateral $DEQP$ to the area of quadrilateral $ABCP$.

A. 1:2

B. 2:3

C. 3:5

D. 4:9



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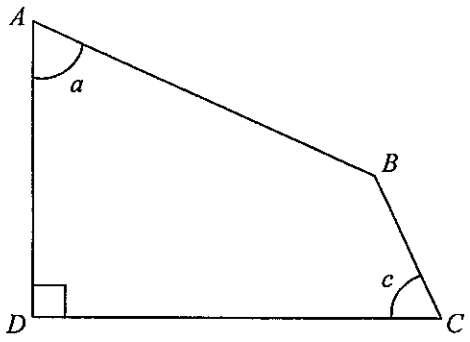
21. In the figure, $AD =$

A. $AB\cos a + BC\cos c$.

B. $AB\cos a + BC\sin c$.

C. $AB\sin a + BC\cos c$.

D. $AB\sin a + BC\sin c$.



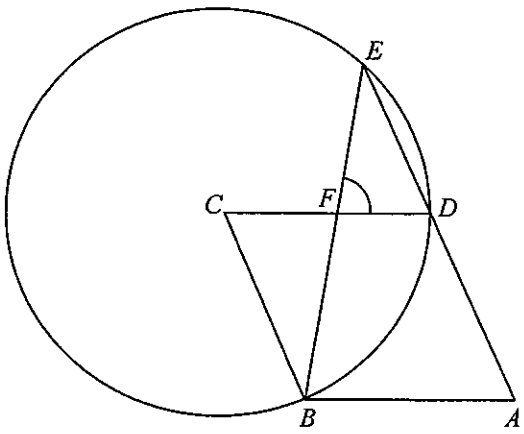
22. In the figure, $ABCD$ is a rhombus. C is the centre of the circle BDE and ADE is a straight line. BE and CD intersect at F. If $\angle ADC = 118°$, then $\angle DFE =$

A. 59° .

B. 62° .

C. 78° .

D. 87° .



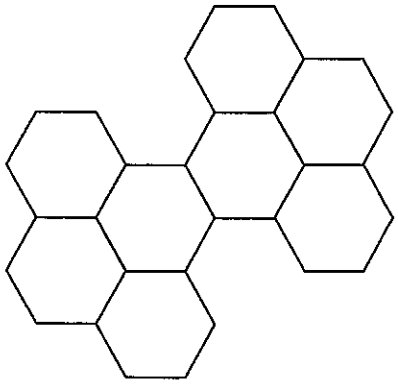
23. The figure below consists of eight identical regular hexagons. The number of axes of reflectional symmetry of the figure is

A. 2 .

B. 4 .

C. 6 .

D. 8 .



24. If the sum of the interior angles of a regular n-sided polygon is $3\,240°$, which of the following is true?

A. The value of n is 16.

B. Each exterior angle of the polygon is $18°$.

C. The number of diagonals of the polygon is 20.

D. Each interior angle of the polygon is $160°$.

25. If the straight lines $hx+ky+15=0$ and $4x+3y-5=0$ are perpendicular to each other and intersect at a point on the x-axis, then $k=$

A. -12.

B. -4.

C. 3.

D. 16.

26. The coordinates of the points A and B are $(9,-2)$ and $(-1,8)$ respectively. If C is a point lying on the straight line $x-2y=0$ such that $AC=BC$, then the x-coordinate of C is

A. 1.

B. 2.

C. 3.

D. 4.

27. The equation of the circle C is $3x^2+3y^2-12x+30y+65=0$. Which of the following are true?

I. The radius of C is 14.
II. The origin lies outside C.
III. The coordinates of the centre of C are $(2,-5)$.

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

Go on to the next page

28. Christine has one \$1 coin, one \$2 coin, one \$5 coin and one \$10 coin in her pocket. If Christine takes out three coins randomly from her pocket, find the probability that she gets at least \$13 .

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

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

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

D. $\frac{23}{24}$

29. A bag contains 1 red ball, 3 yellow balls and 6 white balls. In a lucky draw, a ball is randomly drawn from the bag and a certain number of tokens will be got according to the following table:

Colour of the ball drawn	Red	Yellow	White
Number of tokens got	90	20	10

Find the expected number of tokens got in the lucky draw.

A. 10

B. 21

C. 40

D. 61

30. Consider the following data:

32 68 79 86 88 98 98 a b c

If the mean and the mode of the above data are 77 and 68 respectively, then the median of the above data is

A. 76 .

B. 82 .

C. 85 .

D. 93 .

Section B

31. The L.C.M. of $9a^2b$, $12a^4b^3$ and $15a^6$ is

A. $3a^2$.

B. $3a^2b$.

C. $180a^6b^3$.

D. $180a^{12}b^4$.

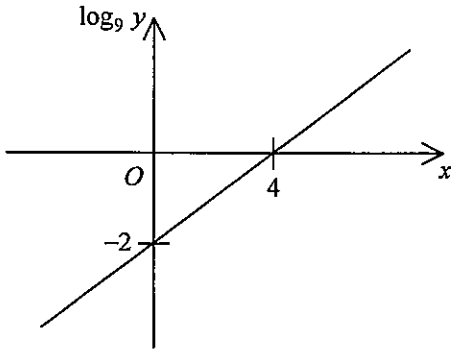
32. The graph in the figure shows the linear relation between x and $\log_9 y$. If $y = ab^x$, then $b =$

A. -2.

B. $\frac{1}{81}$.

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

D. 3.



33. $BC000DE000000_{16} =$

A. $188\times16^{11}+222\times16^6$.

B. $205\times16^{11}+239\times16^6$.

C. $188\times16^{12}+222\times16^7$.

D. $205\times16^{12}+239\times16^7$.

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34. Let $u=\dfrac{7}{a+i}$ and $v=\dfrac{7}{a-i}$, where a is a real number. Which of the following must be true?

I. uv is a rational number.
II. The real part of u is equal to the real part of v.
III. The imaginary part of $\dfrac{1}{u}$ is equal to the imaginary part of $\dfrac{1}{v}$.

A. I only

B. II only

C. I and III only

D. II and III only

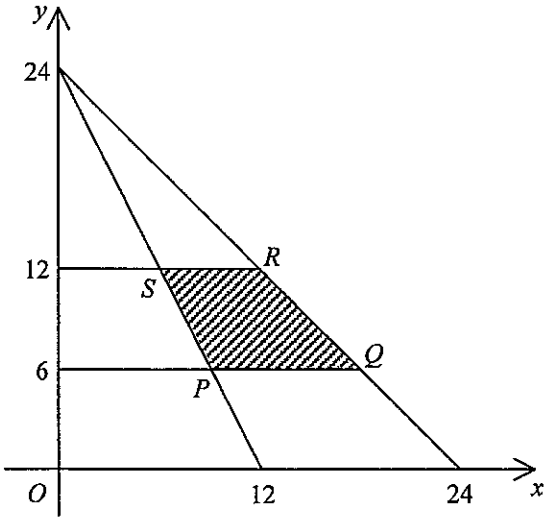
35. In the figure, PQ and SR are parallel to the x-axis. If (x, y) is a point lying in the shaded region $PQRS$ (including the boundary), at which point does $7y-5x+3$ attain its greatest value?

A. P

B. Q

C. R

D. S



36. Let a_n be the nth term of a geometric sequence. If $a_3=21$ and $a_7=189$, which of the following must be true?

I. The common ratio of the sequence is less than 1.
II. Some of the terms of the sequence are irrational numbers.
III. The sum of the first 99 terms of the sequence is greater than 3×10^{24}.

A. I only

B. II only

C. I and III only

D. II and III only

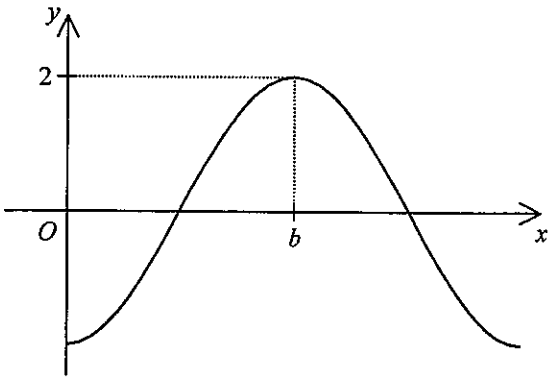
37. Let a and b be constants. If the figure shows the graph of $y = a\cos 2x°$, then

A. $a = -2$ and $b = 90$.

B. $a = -2$ and $b = 360$.

C. $a = 2$ and $b = 90$.

D. $a = 2$ and $b = 360$.



38. For $0° \le \theta \le 360°$, how many roots does the equation $5\sin^2\theta + \sin\theta - 4 = 0$ have?

A. 2

B. 3

C. 4

D. 5

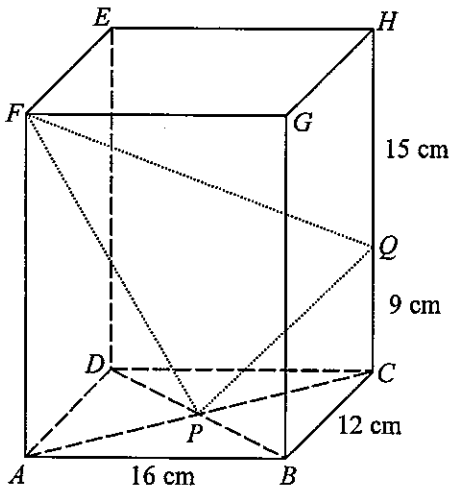
39. In the figure, $ABCDEFGH$ is a rectangular block. AC and BD intersect at P. Q is a point lying on CH such that $CQ = 9\,\text{cm}$ and $QH = 15\,\text{cm}$. Find $\sin\angle PFQ$.

A. $\frac{33}{65}$

B. $\frac{56}{65}$

C. $\frac{13}{5\sqrt{181}}$

D. $\frac{58}{13\sqrt{181}}$



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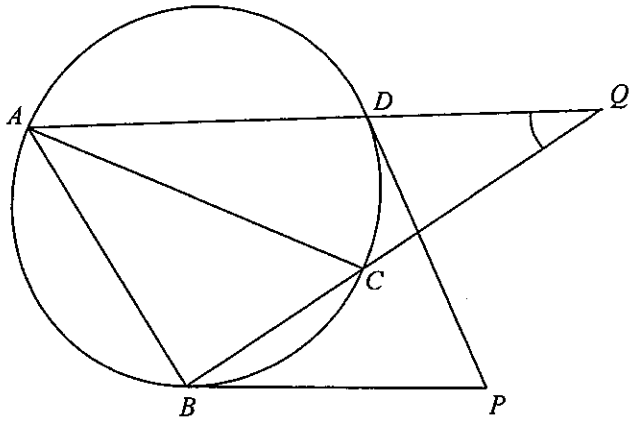
40. In the figure, AC is a diameter of the circle $ABCD$. PB and PD are tangents to the circle. AD produced and BC produced meet at Q. If $\angle BPD = 68°$, then $\angle AQB =$

A. $22°$.

B. $28°$.

C. $32°$.

D. $34°$.



41. The straight line $2x - y - 6 = 0$ and the circle $x^2 + y^2 - 8y - 14 = 0$ intersect at P and Q. Find the y-coordinate of the mid-point of PQ.

A. -4

B. -2

C. 2

D. 4

42. There are 9 cans of coffee and 3 cans of tea in a box. If 4 cans are randomly chosen from the box, find the probability that at least 2 cans of tea are chosen.

A. $\frac{13}{55}$

B. $\frac{21}{55}$

C. $\frac{34}{55}$

D. $\frac{42}{55}$

43. There are 20 boys and 15 girls in a class. If 6 students are selected from the class to form a committee consisting of at most 2 girls, how many different committees can be formed?

A. 271320

B. 324 415

C. 508 725

D. 780 045

44. The stem-and-leaf diagram below shows the distribution of the scores (in marks) of a group of students in a test. Ada gets the highest score in the test.

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

Which of the following is/are true?

I. The upper quartile of the distribution is 55 marks.
II. The standard score of Ada in the test is lower than 2 .
III. The standard deviation of the distribution is greater than 12 marks.

A. I only

B. II only

C. I and III only

D. II and III only

45. The variance of a set of numbers is 49 . Each number of the set is multiplied by 4 and then 9 is added to each resulting number to form a new set of numbers. Find the variance of the new set of numbers.

A. 196

B. 205

C. 784

D. 793

END OF PAPER