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Form 3

Mid-Year Examination 2014-2015

Mathematics

Paper II

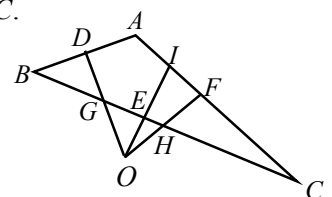
INSTRUCTIONS

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.

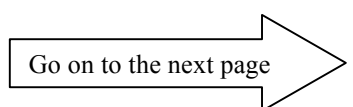
1. $\frac{5^{n+2} - 35(5^{n-1})}{18(5^{n+1})} =$
- A. $\frac{1}{18}$ B. $\frac{1}{15}$ C. $\frac{1}{5}$ D. 5^n
2. If $(10^x)^y = (2^z)(5^z)$, then which of the following must be true:
- A. $xy = z$ B. $xy = 2z$ C. $xy = z^2$ D. $x^y = 2z$
3. If n is an integer, which of the following must be positive?
- A. $(-2)^n$ B. $(n-2)(n+2)$ C. n^2 D. $8n$
4. Suppose a and b are two consecutive natural numbers. Which of the following must be true?
- A. ab is even B. $a+b$ is even C. $\frac{ab}{4}$ is an integer D. $a^2 + b^2$ is even
5. If $b < 0 < a$, which of the following must be negative?
- I. ab
 II. $a+b$
 III. $b-a$
- A. I only B. I and III only C. II and III only D. I, II and III
6. If $\frac{a}{b} < 3$, which of the following must be true?
- A. $a < 3b$ B. $a > -3b$ C. $a - b < 3$ D. $ab < 3b^2$
7. If $a > b > c > d$, which of the following must be true?
- I. $a + c > b + d$
 II. $ab > cd$
 III. $(a-b)(c-d) > 0$
- A. I and II only B. I and III only C. II and III only D. I, II and III
8. Solve $5(x+2) - 2(x-4) < -6$.
- A. $x < -8$ B. $x < 8$ C. $x > -8$ D. $x > 8$
9. Which of the following numbers does not satisfy the inequality $-2(x-1) < -6$?
- A. 1.3π B. $\sqrt{18}$ C. 4.1 D. 4

10. If A is 30% greater than B and B is 30% less than C , then
 A. $A = C$. B. A is 9% less than C .
 C. A is 9% greater than C . D. C is 9% greater than A .
11. If the length of a rectangle is increased by 25% and the area remains the same, find the percentage change of its width.
 A. Decreased by 25% B. Decreased by 20%
 C. Increased by 18% D. Increased by 20%
12. The annual interest rate of a bank is 5%. Jenny puts two deposits of the same amount in the bank. If the compound interest of one deposit compounded annually for 2 years is \$10 more than the simple interest of the other deposit for 2 years, how much is each deposit?
 A. \$600 B. \$1 200 C. \$4 000 D. \$10 000
13. Tim paid \$940 for the rates of his house for half a year. If the rates are charged at 5% p.a., find the rateable value of his house.
 A. \$18 800 B. \$24 000 C. \$27 500 D. \$37 600
14. Jack borrowed \$100 000 from a bank. The interest was compounded half-yearly. If the compound interest after one year was \$18 810, find the annual interest rate.
 A. 9% B. 12% C. 15% D. 18%
15. A man borrows \$10000 from a bank at 12% per annum compounded monthly. He repays the bank \$2000 at the end of each month. How much does he still owe the bank just after the second repayment?
 A. \$6181 B. \$6200 C. \$6201 D. \$8304
16. Which of the following sets of line segments can form a triangle?
 I. 2 cm, 3 cm, 4 cm
 II. 4 cm, 6 cm, 8 cm
 III. 3 cm, 12 cm, 16 cm
 A. I only B. II only C. I and II only D. I, II and III

17. In the figure, OGD , OEI and OHF are the three perpendicular bisectors of $\triangle ABC$. Which of the following must be true?



- I. O is the orthocentre of $\triangle ABC$.
 II. $\triangle OEH \sim \triangle CFH$
 III. $BE = CE$
 A. I only B. III only C. I and III only D. II and III only



18. Each side of a square is measured to be 8.2 cm. If the measurement is corrected to 0.1 cm, then what is the maximum absolute error of its perimeter?

- A. 0.05cm B. 0.1cm C. 0.15cm D. 0.2cm

19. If $a = \frac{1}{t} + t$, $b = \frac{1}{t} - t$, then $a^2 + b^2 =$

- A. $\frac{1}{t^2} + t^2$. B. $2 \left(\frac{1}{t} + t \right)$. C. $2 \left(\frac{1}{t^2} - t^2 \right)$ D. $2 \left(\frac{1}{t^2} + t^2 \right)$

20. If $(1 + a)(1 + b)(1 + c) = abc$, express c in terms of a and b .

- A. $-\frac{(1+a)(1+b)}{1+a+b}$ B. $\frac{(1+a)(1+b)}{1+a+b}$ C. $\frac{(1-a)(1-b)}{1+a+b}$ D. $-\frac{(1+a)(1+b)}{1-a-b}$

21. If $\tan \theta = 2$, then $\cos \theta =$

- A. $\frac{1}{2}$. B. $\sqrt{5}$. C. $\frac{1}{\sqrt{5}}$. D. $\frac{2}{\sqrt{5}}$.

22. Which of the following cannot be read directly from the frequency polygon?

- I. Mean
II. Median
III. Mode

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

23. The following table shows the age distribution of a class.

Age	8 - 9	10 - 11	12 - 13	14 - 15
Frequency	11	14	22	3

Find the mean age of this class.

- A. 10.68 B. 11.18 C. 11.5 D. 11.68

24. If the mean of x_1 , x_2 and x_3 is 6, then the mean of $3x_1 + 1$, $3x_2 + 1$ and $3x_3 + 1$ is

- A. 6. B. 7. C. 18. D. 19.

25. Consider the data set:

15, 6, x , 4, 11, 11, y , 16, 13, z

If the mean is 12 and the mode is 16, find x , y and z , where $x \leq y \leq z$.

- A. $x = 12, y = 16, z = 16$. B. $x = 13, y = 16, z = 16$.
C. $x = 16, y = 16, z = 18$. D. $x = 16, y = 16, z = 20$.

26. 75 runners participated in a marathon race in which the ratio of males to females is 3 : 2. The mean completion time of each male participant in the race is 9 min while the mean completion time of each female participant in the race is 12 min. Find the mean completion time of the 75 runners.
- A. 9.6 min B. 10.2 min C. 10.5 min D. 11.1 min

27. The distribution of the heights of students is listed below.

Height (cm)	150 – 154	155 – 159	160 – 164	165 – 169	170 – 174
Frequency	1	13	6	10	12

In which class does the median of the heights of students appear?

- A. “155 cm – 159 cm” B. “160 cm – 164 cm”
 C. “165 cm – 169 cm” D. “170 cm – 174 cm”
28. A group of seven students have joined a test. It is given that the scores of the students are different. If one of the students knows his score and wants to guess whether he could enter the first three ranks, which information about the scores should he know?
- A. median B. mean C. maximum score D. minimum score

29. The following table shows the scores of a student obtained in different papers of a test.

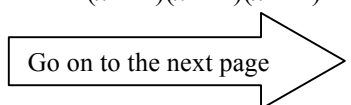
Paper	I	II	III
Weight	25	10	y
Score	x	85	50

Given that the weighted mean test score of the student is 62 and the sum of scores and weights of the papers is 245, find the value of x .

- A. 15 B. 45 C. 60 D. 75
30. Solve $(2^x - 1)(2^x - 2) = 6$.
- A. $x = 2$ B. $x = 3$ C. $x = 7$ or $x = 8$ D. $x = 4$ or $x = -1$.
31. If h is a root of the equation $x^2 + 5x - 1 = 0$, then $2h^2 + 10h =$
- A. 1. B. 2. C. 4. D. 5.

32. Simplify $\frac{4}{x^2 - 4} - \frac{3}{x^2 - x - 2}$.

- A. $\frac{1}{(x+1)(x+2)}$ B. $\frac{1}{(x+1)(x-2)}$ C. $\frac{1}{(x-1)(x-2)}$ D. $\frac{x+10}{(x+1)(x-2)(x+2)}$

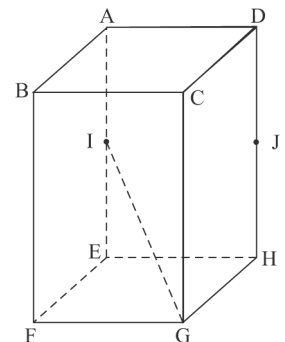


33. If $p(x^2 - x) + q(x^2 + x) \equiv 4x^2 + 8x$, find p and q .
- A. $p = 4, q = 8$ B. $p = -8, q = 4$ C. $p = -2, q = 6$ D. $p = 6, q = -2$

34. Given $x(2x + 3) = x(3x - 4)$. Find x .
- A. 0 only B. 7 only C. 0 or 7 D. $\frac{3}{2}$ or $\frac{4}{3}$

35. In factorizing the expression $a^4 + a^2b^2 + b^4$, we find that
- A. $(a^2 - b^2)$ is a factor B. $(a^2 + b^2)$ is a factor
 C. $(a^2 - ab + b^2)$ is a factor D. it cannot be factorized.

36. The figure shows a cuboid, where I and J are the mid-points of AE and DH respectively. Which of the following is the angle between the line GI and plane $CDHG$?



- A. $\angle IGC$
 B. $\angle IGE$
 C. $\angle IGJ$
 D. $\angle IGH$

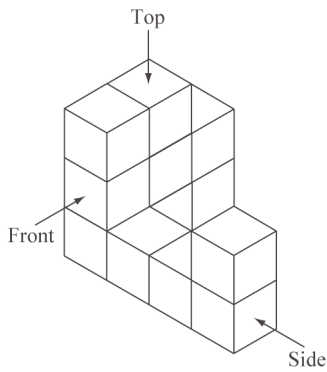
37. If $a : b = 3 : 2$, and $b : c = 4 : 3$, then $\frac{a + b - 2c}{a - b + 2c} =$
- A. $\frac{1}{4}$ B. $\frac{1}{2}$ C. 2 D. 4.

38. Which of the following may be a pair of dual polyhedra?

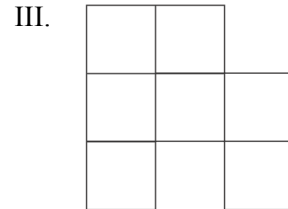
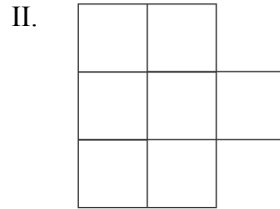
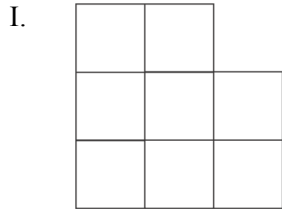
Regular Polyhedron	No. of vertices (V)	No. of faces (F)	No. of edges (E)
I	4	4	6
II	6	8	12
III	8	6	12
IV	20	12	30

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

39.



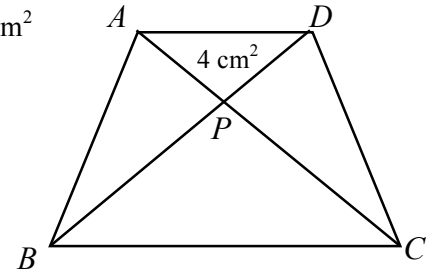
Which of the following can be the side view(s) of the given figure?



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

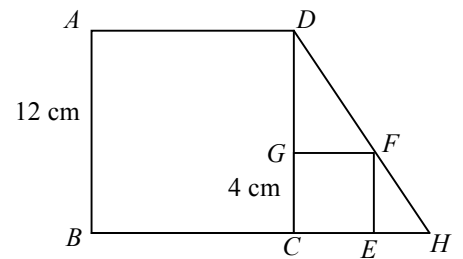
40. In the figure, area of $\triangle APD$: area of $\triangle CPD = 2 : 3$. If the area of $\triangle APD = 4\text{cm}^2$ and $\triangle CPD \cong \triangle BPA$, find the area of the trapezium $ABCD$.

- A. 19 cm^2
 B. 25 cm^2
 C. 28 cm^2
 D. 32 cm^2



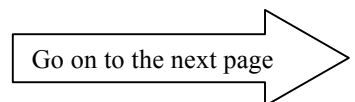
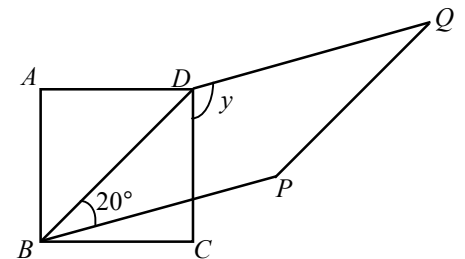
41. In the figure, $ABCD$ and $CEFG$ are squares with sides 12 cm and 4 cm respectively. Find the perimeter of the trapezium $ABHD$. (Given the answer correct to 3 significant figures.)

- A. 48.0 cm
 B. 52.0 cm
 C. 55.4 cm
 D. 67.4 cm

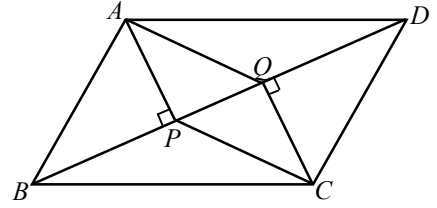


42. In the figure, $ABCD$ is a square and $BDQP$ is a rhombus. Find y .

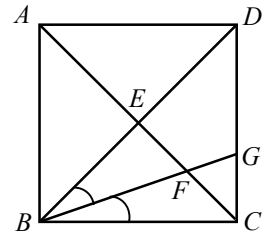
- A. 100°
 B. 105°
 C. 112.5°
 D. 115°



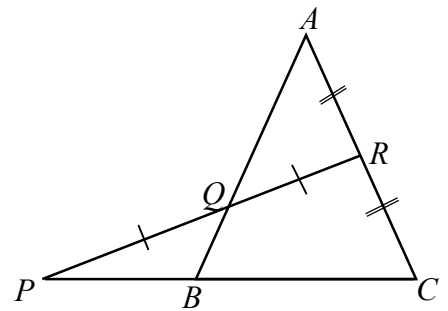
43. In the figure, $ABCD$ is a parallelogram. $AP \perp BD$ and $CQ \perp BD$. Which of the following must be true?
- $APCQ$ is a parallelogram.
 - $\triangle ABP$ is an isosceles triangle.
 - $\triangle AQD \cong \triangle CPB$
- A. I only B. III only
 C. I and III only D. II and III only



44. In the figure, $ABCD$ is a square. BG is the angle bisector of $\angle DBC$. What is the ratio of $EF : DG$?
- A. 1 : 1
 B. 1 : 2
 C. 2 : 3
 D. 3 : 4



45. In the figure, $AR = RC$ and $PQ = QR$. Find the ratio of $AQ : QB$.
- A. 1 : 1
 B. 1 : 2
 C. 3 : 1
 D. 3 : 2



~~End of Paper~~