Eton College King's Scholarship Examination 2024

MATHEMATICS A

(One and a half hours)

Candidate Number…….

<u>Please write your candidate number on EVERY sheet.</u>

This paper is divided into two sections:
Section I (Short-answer questions) – 50 marks available
Section II (Extended questions) – 50 marks available

Answer all of Section I and as many questions as you can from Section II.

The marks for each question are given in square brackets.

Show all your working.

No diagram is drawn to scale.

Neither calculators nor protractors may be used.

<u>ADDITIONAL MATERIALS:</u> NONE

Do not turn over until told to do so.

Section I: Short-answer questions (50 marks)

1. Find the value of the following, giving your answers as **reduced, mixed** fractions, where appropriate:

(a) $2\frac{2}{3}\times 3\frac{3}{4}$ [3]

(b) $3\frac{5}{9}\div 5\frac{1}{3}$ [3]

(c) $2001\frac{3}{5}-1998\frac{5}{7}$ [3]

2. Evaluate the following, giving your answer as a **decimal or whole number**, where appropriate:

(a) 2.6×0.0008 [3]

(b) $0.00224 \div 0.032$ [3]

(c) $(0.005)^3$ [3]

3. Given that $p = -4$ and $q = \frac{1}{2}$, evaluate the following exactly:

(a) $-p^3$ [2]

(b) $\frac{p-q}{q}$ [2]

4. Solve the following equations, leaving your answers as exact simplified fractions:

(a) $3-6x = x+5$ [2]

(b) $\frac{3}{4}(2x-1) = -\frac{3}{8}$ [3]

5. Solve the following simultaneous equations:

$$3x - 5y = 31$$
$$y = 2x + 12$$

[4]

6. (a) By what do you **multiply** $4\frac{2}{5}$ by to get 11? [2]

(b) By what do you **divide** $\frac{2x}{y^2}$ by to get $\frac{3y}{2x}$? [2]

7. An empty sand pit has a weight of 60 Newtons. The weight of the sand pit increases to 500 Newtons when filled with sand. A different empty sand pit is 14% heavier but holds 25% less sand. Calculate the weight of this sand pit when it is full of sand. [4]

8. Solve the following inequality, leaving x on the left-hand side in your final answer:

$$0.25\times(5-2x)\leq\frac{1}{2}-\frac{x-2}{3}$$ [4]

9. In a recent maths test, the 14 pupils in Amir's class had a mean score of 72%, while the 16 pupils in Jack's class had a mean score of 69%. Calculate the combined mean score of the two classes. [3]

10. There are six cards with whole numbers on them. The mean of the six cards is 7, the mode is 10, the median is 8.5, and the range is 8. List all possible sets of six numbers in ascending order. [4]

Section II: Extended questions (50 marks)

11. The prime factorisation of 120 is $2^3 \times 3 \times 5$.

(a) Calculate the prime factorisation of 6500. [2]

Your answers to the following should be evaluated exactly.

(b) Evaluate the highest common factor of 120 and 6500. [2]

(c) Evaluate the lowest common multiple of 120 and 6500. [2]

(d) How many factors does 6500 have? [2]

(e) What is the smallest positive integer I need to multiply 6500 by to get a number which is a perfect square ending with four zeros? [2]

12. You are given that $975 \times 792 = 772200$. Showing your working clearly, **use this result** to evaluate the following:

(a) 0.00975×7.92 [2]

(b) $9.75 \div 0.07722$ [2]

(c) 975×208 [2]

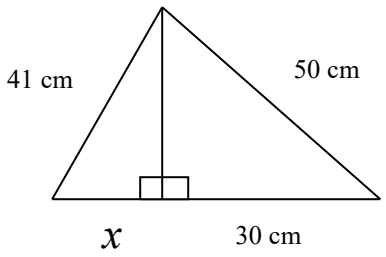
(d) 975×792.0792 [2]

(e) $773.175 \div 975$ [2]

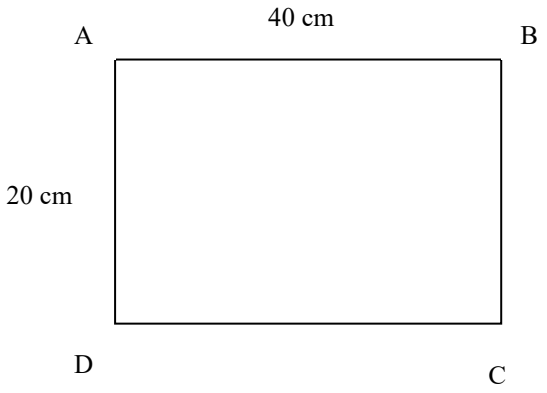
13. (a) Expand and simplify $(a+b)(a-b)$. [1]

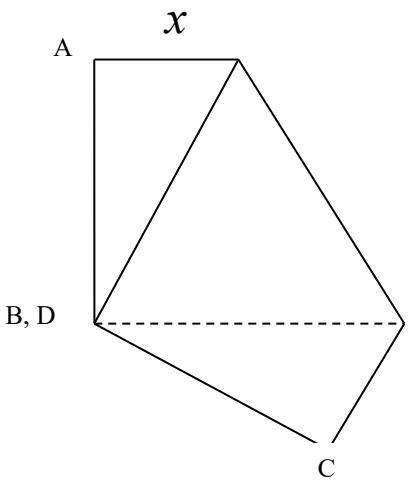
(b) Using this result, evaluate $45^2 - 35^2$. [1]

(c) Find the missing length x in the diagram below. [4]

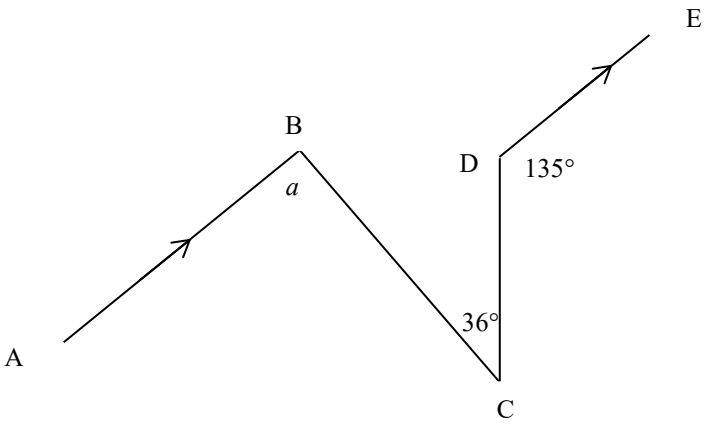


(d) The corner of a rectangular piece of paper measuring 20cm by 40cm is folded across to its diagonally opposite corner, as shown in the two diagrams below. Calculate the exact length x in the second diagram. [4]





14. (a) In the diagram below lines AB and DE are parallel. Calculate angle a. [3]



In the next two parts, marks will not be given without a clear diagram and working.

(b) The bearing of Eton from Winchester is 030°, calculate the bearing of Winchester from Eton. [3]

(c) From lighthouse A, a ship is seen on a bearing of 054°. As seen from the ship, the angle between the directions of lighthouse A and lighthouse B is 142°. What are the possible bearings of the ship from lighthouse B? [4]

15. A football team plays some games in a season. Each game was a win, a draw or a loss. The ratio of the games they won to the games they did not win was 9:7. The ratio of games they lost to games they did not lose was 1:7.

Let the number of wins be W, the number of draws be D and the number of losses be L.

(a) Show that $7W = 9(D + L)$ and find a second equation linking W, D and L. [3]

(b) Eliminate D to show that $W = \frac{9}{2}L$. [2]

(c) Show further that $D = kL$, where k is a fraction to be found. [2]

The team played less than 50 games.

(d) By forming an inequality, find the maximum number of games the team could have lost, and hence the maximum number of games the team could have won. [3]

End of paper