First name	
Last name	
School	

COMMON ACADEMIC SCHOLARSHIP EXAMINATION

MATHEMATICS

ISEB

Independent Schools
Examinations Board

Specimen Paper

Date   Time allowed: 90 minutes

Instructions

There are two sections: Section A and Section B.

Answer **all** the questions in Section A.

Attempt as many questions in Section B as you can.

Questions may be answered in any order.

You may **not** use a calculator for this examination.

Show all your working.

Concentrate on complete solutions to questions rather than fragmentary answers.

Diagrams are **not** draw to scale unless otherwise specified.

Final answers should be <u>double-underlined</u> and must contain correct units where necessary.

SECTION A

(40 marks)

Answer ALL the questions in this section.

1. Write

   i) $\frac{7}{12}$ as a percentage

   ii) $\frac{7}{120}$ as a decimal

   [4]

2. Calculate

   i) $\frac{3}{2} - \frac{1}{3} \div \frac{1}{2}$

   ii) 10% of 20% of 30% of 50% of 1200

   [4]

3. Simplify

   i) $3p(2p - 4r) - 4r(r - 2p)$

   ii) $6a^2b \times (2ab)^2$

   iii) $(2xy^2)^3 \div (3x^2y)^2$

   [6]

4. If $a = 2$, $b = 3$ and $c = {}^-4$, find the value of

   i) $6a - 5bc$ 　　　　　　　　ii) $a^2 + 2b^2 - c^2$ 　　　　　　　　iii) $\dfrac{a^b b^a}{c^3}$

                                                                    [6]

5. Use the result **34 × 825 = 28 050** to write down the value of

   i) 3.4 × 82.5 ÷ 2 　　　　　　ii) 28 084 ÷ 34 　　　　　　(iii) 34 × 165
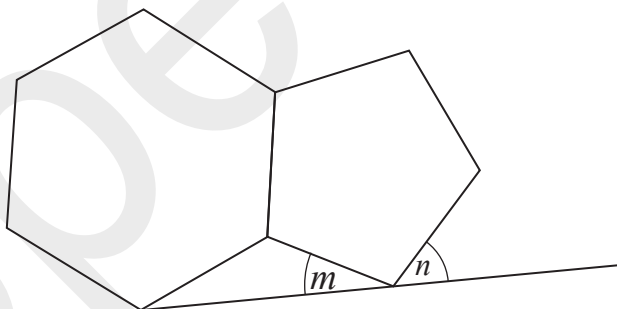
                                                                    [3]

6. The diagram shows a regular pentagon touching a regular hexagon.

   Calculate the size of the angles marked m and n

                                                                    [6]

Turn over

7.   i) Write 54 and 30 each as the **products of prime factors**.

    ii) Work out the **lowest common multiple** of 30 and 54

    iii) What is the smallest number you need to multiply the product of 30 and 54 by to give
        a square number?

                                                                                    [6]

8.   Look at the sequence 5, 13, 21, 29, ...
       Which term in the sequence has a value of 613?

                                                                                    [5]

Attempt as many questions as you can in this section.

1. a) Work out **as simply as possible**

    i) $15 - 16 + 17 - 18 + 19 - 20 + 21 - 22$

    ii) $97 \times 48 + 48^2 - 48 \times 45$

    iii) $\dfrac{51 + 49 \times 51}{20 \times 5.1}$

    b) In May, Jacques spent 80% of his monthly salary and saved the rest.

    In June, his monthly salary increased by £800, and he saved 15% of his new monthly salary.

    If he saved the same amount in May and in June, find his new monthly salary.

[9]

Turn over

2. i) Solve the simultaneous equations

$$2x + y = 9$$
$$5x - y = 17$$

ii) Use your answers to part (i) to write down all the solutions to these simultaneous equations:

a) $2\sqrt{c} + \sqrt{d} = 9$

$5\sqrt{c} - 3\sqrt{d} = 17$

b) $2r - s = 27$

$5r + 3s = 51$

[6]

3. i) Write down the next two terms in each of the following sequences:

   a) 1 , 8 , 27 , 64 , ... , ...

   b) 3 , 12 , 27 , 48 , ... , ...

   ii) Use your answers to part (i) to write down the next two terms in these sequences.

   a) ⁻2 ,   ⁻4 ,   0 , 16 , ...

   b) 3 , $\frac{3}{2}$,   1 , $\frac{3}{4}$, ...

   iii) In the sequence in (ii)(b), what is the value of the first term that is less than $\frac{1}{20}$?

[8]

Turn over

4. Lucy drives her car from *A* to *B* at a speed of 30 km/h for 6 minutes.

She then drives from *B* to *C* at a speed of 90 km/h for 12 minutes.

   i) Calculate the mean speed of Lucy's car in km/h for the journey from *A* to *B* to *C*.

Lucy now drives her car at 90 km/h from *C* to *D*.

   ii) How long will the journey from *C* to *D* take if the car has a mean speed of 75 km/h for the whole journey from *A* to *B* to *C* to *D*?

[7]

5. i) Draw and label the graph of $y = 4 - \dfrac{x^2}{2}$ on the axes below.
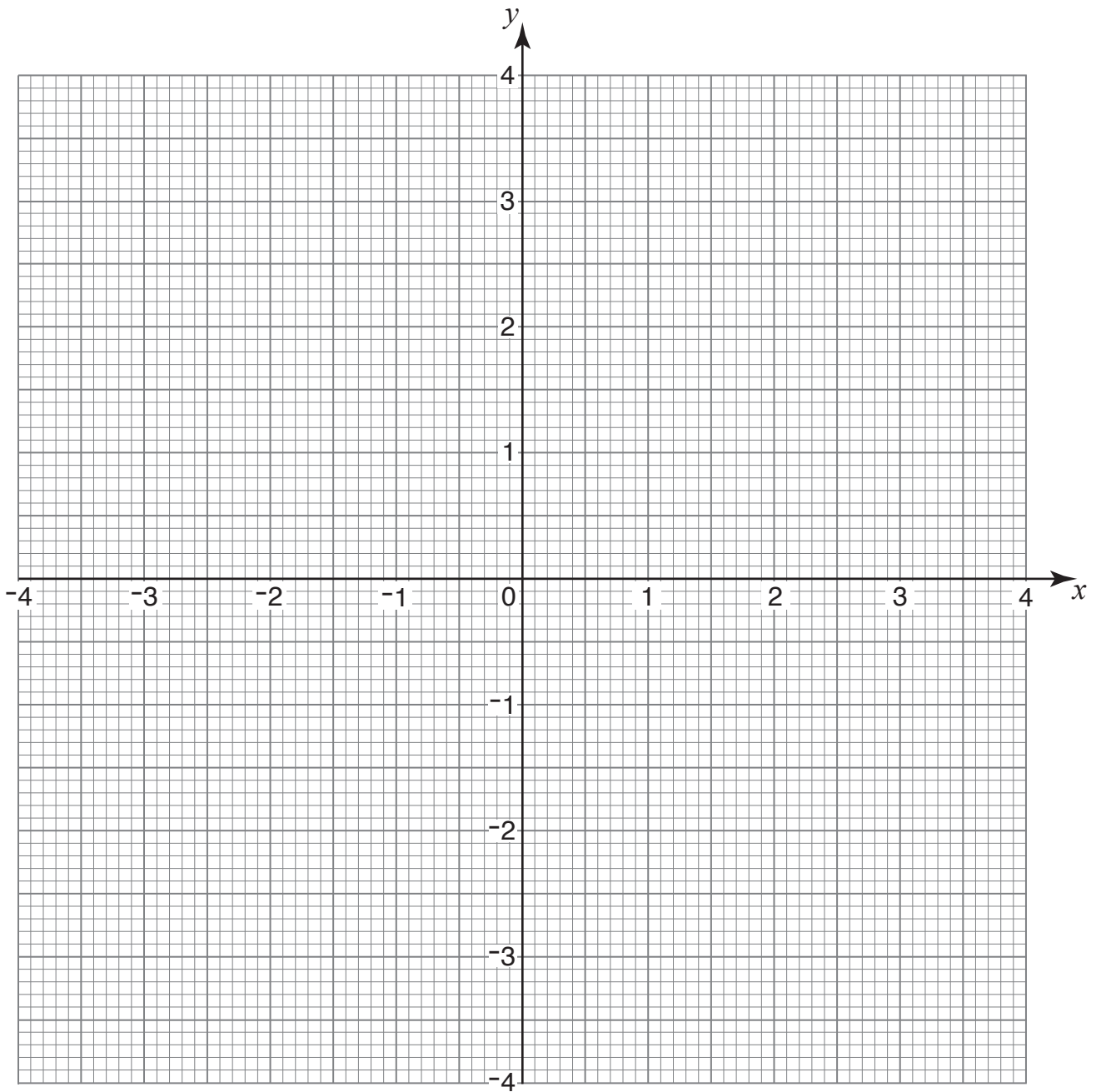
ii) Reflect the graph of $y = 4 - \dfrac{x^2}{2}$ in the line $y = {}^-x$

The two curves intersect at ($^-$2, 2).

iii) At which other point do the curves cross?   Answer: ....

[8]

Turn over

6. Steven has a fair die whose six faces are numbered   2, 2, 4, 4, 4 and 6

   Claude has a fair die whose six are numbered   1, 3, 3, 3, 5, and 5

   i) If they each throw their die, what is the probability that Steven will throw a higher score than Claude?
   You may wish to complete the table showing when Steven's score is higher than Claude's.

Claude's score

>	1	3	3	3	5	5
2						
2	✓					
4						
4			✓			
4						
6			✓			

Steven's score
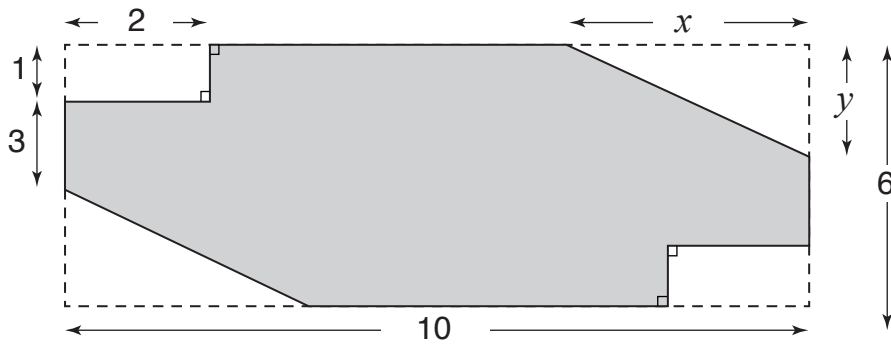
key: 2 > 1 ✓
       4 > 3 ✓
       6 > 3 ✓

   ii) Alter one of the numbers on one of the dice so that each boy has an equal chance of throwing the higher score.

   (*You can only use numbers 1, 2, 3, 4, 5 or 6*)

   Answer: ....'s numbers are now ...., ..., ..., ..., ..., ...

[6]

10

7. A rectangle, 10cm by 6cm, has its four corners cut off to form a shape with a rotational symmetry order 2

Lengths are marked in cm

i) Calculate the value of y

ii) Calculate the value of x if the logo has $\frac{5}{6}$ of the area of the original rectangle.

iii) Calculate the perimeter of the logo, leaving your answer in the form $a + b\sqrt{c}$ where a, b and c are whole numbers.

iv) The logo is enlarged and its new area is 450 cm^2.

Calculate the new perimeter.

[8]

TURN OVER FOR QUESTION 8

Turn over

8. The operation $@$ is defined as

$$x \mathbin{@} y = x + y - xy$$

 i) Calculate

    a) $7 \mathbin{@} 11$

    b) $(3 \mathbin{@} 4) \mathbin{@} 5$

 ii) Simplify the expression

    $a \mathbin{@} (a \mathbin{@} a)$

[8]

(Total marks for Section B: 60)

(Total marks for paper: 100)