



Coimisiún na Scrúduithe Stáit State Examinations Commission

JUNIOR CERTIFICATE EXAMINATION, 2009

MATHEMATICS – HIGHER LEVEL

PAPER 1 (300 marks)

THURSDAY, 4 JUNE – MORNING, 9:30 to 12:00

Attempt **ALL** questions.


Each question carries 50 marks.

Graph paper may be obtained from the superintendent.


The symbol  indicates that supporting work must be shown to obtain full marks.

1. (a) In a school library, 28% of the books are classified as fiction and the remainder as non-fiction.

There are 3240 non-fiction books in the library.

-  Find the number of books which are classified as fiction.




- (b) (i)  Given that $x = 2 \times 10^{-3}$ and $y = 7 \times 10^{-4}$, evaluate $x + 8y$.
Express your answer in the form $a \times 10^n$,
where $n \in \mathbf{Z}$ and $1 \leq a < 10$.


- (ii) A supermarket has a special offer on three different brands of packets of soap.

The following table gives details of the offer:


Brand	No. of bars per packet	Weight of each bar	Price of packet
A	3	100g	€1.35
B	6	100g	€2.40
C	4	125g	€2.38

-  Which brand has the cheapest price per gram?


- (c) A man travels from Arklow to Blanchardstown, a distance of 90 km. He leaves Arklow at 09:25 and arrives in Blanchardstown at 10:55.

- (i)  Calculate his average speed for the journey.

He continues from Blanchardstown to Cootehill, a distance of 112 km. He increases his average speed by 4 km/h for this section of his journey.

- (ii)  At what time does he arrive in Cootehill?

2. (a) Eight workers can build a cabin in 60 hours.

 How many workers are needed if the cabin is to be built in 32 hours?



(b) A group of 49 students was asked which fruit each liked.


28 said they liked apples. 25 said they liked pears while 26 said they liked oranges.


8 said they liked all three types of fruit.


17 said they liked pears and oranges. 11 said they liked apples and oranges.

5 said they did not like any of the three types of fruit.

Let x represent those students who liked apples and pears but not oranges.


(i)  Represent the above information on a Venn diagram.


(ii)  Calculate the value of x .


(iii)  Calculate the percentage of students who liked one type of fruit only.
Give your answer correct to the nearest whole number.



(c) Three business partners, Aideen, Brian and Caroline, invest €30 000, €40 000 and €70 000 respectively. At the end of each year, 22.5% of the profit made is placed in reserve and the remainder is divided among the partners in proportion to their investments.

(i)  Given that in 2007, the profit amounted to €12 880, calculate the amount placed in reserve.

(ii)  In 2008, Caroline's portion of the profit was €9331. Calculate how much Aideen and Brian each received in 2008.

(iii)  Calculate the amount placed in reserve in 2008.

3. (a) ✍ Simplify:

$$(2x - 3)(4 - 5x).$$

(b) (i) ✍ Given that $x = 2t - 1$ and $y = \frac{2}{3}t + 2$, express $3x - y + 2$ in terms of t , in its simplest form.

(ii) ✍ Hence, find the value of t when $3x - y + 2 = 0$.

(c) A swimming pool can be filled by a large pipe operating alone in 4 hours.

(i) What fraction of the pool can be filled by this pipe in 1 hour?

The swimming pool can be filled by a small pipe operating alone in x hours.

(ii) ✍ Derive an expression in x for the fraction of the pool filled by the two pipes working together in 1 hour.

It takes 3 hours for the two pipes working together to fill the pool.

(iii) ✍ Find x .



4. (a) ✍ Given that $y = \sqrt{2x - a}$,
find the value of y when $x = 4$ and $a = -1$.

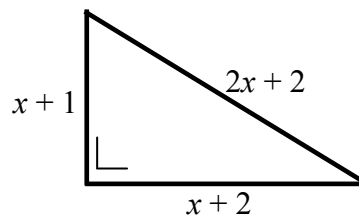
(b) (i) ✍ Graph on the number line the solution set of
 $-3 < 4x + 7 \leq 23, x \in \mathbf{R}$.

(ii) ✍ Solve the following simultaneous equations:

$$x = -\frac{1}{2}y + 36$$

$$y = 2x + 12.$$

(c) The lengths of the sides of a right-angled triangle are as shown in the diagram.



(i) Using the theorem of Pythagoras, write an equation in x .

(ii) ✍ Solve this equation to find x correct to 2 decimal places.

- 5. (a)** ✎ Given that $f(x) = 5x - 12$ and that $f(a) = a$, find the value of a .
- (b) (i)** Let f be the function $f: x \rightarrow 5x - 4$ and g be the function $g: x \rightarrow 3x + 1$.
✎ Using the same axes and scales, draw the graph of f
and the graph of g , for $0 \leq x \leq 3$, $x \in \mathbf{R}$.
- (ii)** From your graphs, write down the co-ordinates of the point of intersection of the two lines.
- (c)** Let f be the function $f: x \rightarrow 2x^2 + x - 15$.
- (i)** ✎ Draw the graph of f for $-4 \leq x \leq 3$, $x \in \mathbf{R}$.
- (ii)** ✎ Use your graph to find the minimum value of $f(x)$.
- (iii)** ✎ Use your graph to find the range of values of x for which $f(x) \geq 0$.

6. (a) ✍ Express in its simplest form:

$$\frac{x+7}{5} + \frac{3-x}{4}.$$

(b) (i) Factorise $25x^2 - 36y^2$.

(ii) Factorise $11x^2 + 75x - 14$.

(iii) ✍ Simplify $(3-4x)^2 - (3-5x)^2$.

(c) (i) ✍ Solve $\frac{6}{x} + \frac{6}{x+2} = \frac{5}{2}$, $x \in \mathbf{R}$.

(ii) ✍ Hence, or otherwise, find the two values of $t \in \mathbf{R}$, for which

$$\frac{6}{2t-1} + \frac{6}{2t+1} = \frac{5}{2}.$$

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