

Question 1

(b) (i) ✍ Simplify $\frac{6x^2 - 17x + 12}{3x - 4}$.

(ii) ✍ Factorise $4c^2 - 3d - 2cd + 6c$.

(iii) ✍ Express in its simplest form:

$$\frac{5}{x-3} - \frac{3}{x-2}$$

Question 2

4. (a) ✍ Graph on the number line the solution set of

$$4 - x \geq 2x - 5, x \in \mathbb{N}.$$

Question 3

(b) Electricity is charged to a consumer at a day rate and at a night rate.

Day rate units are charged at 14 cent per unit and night rate units are charged at 7 cent per unit.

A consumer uses a total of 1100 units for a billing period, at a cost of €129.50.



(i) By letting x equal the number of day rate units used and y equal the number of night rate units used, write two equations to represent the above information.

(ii) ✍ Solve these equations to find the number of each type of unit used.

Question 4

3. (a) When 23 is added to 4 times a certain number, the answer is 11.


✍ Find this number.

Question 5

- (b) An examination paper consists of 40 questions.
5 marks are given for each correct answer.
3 marks are deducted for each incorrect answer.



Kenny answered all 40 questions, getting x correct and getting y incorrect.
His total score for the examination was 56 marks.

- (i) Write two equations to represent the above information.
- (ii)  Solve these equations to find how many questions Kenny answered correctly.


Question 6

- (c) In a certain week, x people shared equally in a club lotto prize of €2000.
- (i) Write down an expression in x for the amount that each person received.

The following week, $x + 1$ people shared equally in the prize of €2000.

- (ii) Write down an expression in x for the amount that each person received that week.

In the second week, each winner received €100 less.

- (iii) Write down an equation in x to represent the above information.
- (iv)  Solve this equation to find the value of x .

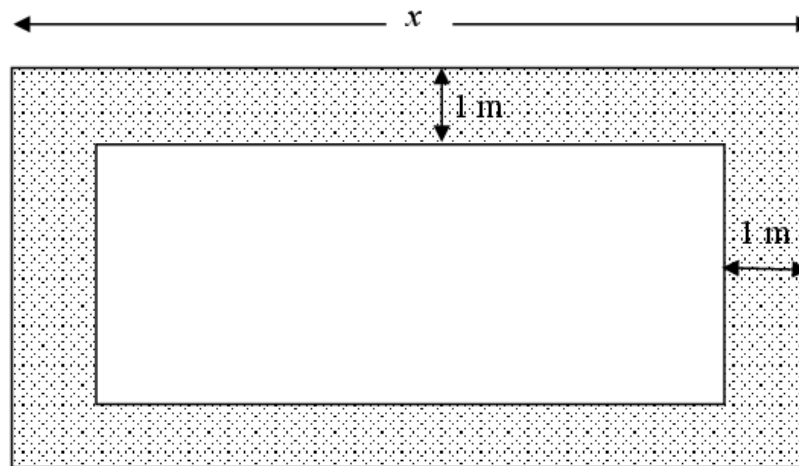
Question 7

6. (a)

The diagram shows a rectangular garden of perimeter 24 m.

The length of the garden is x m.

Write down an expression in x for the width of the garden.



(b) Paving of width 1 m is placed around the garden as shown.

(i) Write expressions in x for the length and width of the inner section.

(ii) ✎ Show that the area, in m^2 , of the inner section is $-x^2 + 12x - 20$.

Question 8

(b)

(i) Factorise $28x^2 - 3x - 1$.

(ii) ✎ Solve $\frac{-47x - 30}{7} = x^2$.

Question 9

(c)

(i) ✎ Express in its simplest form:

$$\frac{1}{2x-3} - \frac{1}{x+3}$$

(ii) ✎ Hence, or otherwise, solve the equation:

$$\frac{1}{2x-3} - \frac{1}{x+3} = 2,$$

giving your answers correct to two decimal places.

Question 10

- (b) (i) ✍ When $x = \frac{1}{2}$, find the value of $\frac{3}{x+2} - \frac{1}{2x+4}$.
- (ii) ✍ Divide $6x^3 - 13x^2 + 27x - 14$ by $3x - 2$.

Question 11

- (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?

Question 12

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?



Question 13

3. (a) ✍ Simplify:

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

Question 14

(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.

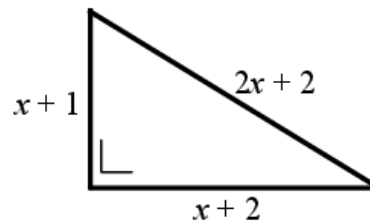
(ii) ✍ Derive an expression in x for the fraction of the pool filled by the two pipes working together in 1 hour.

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

(iii) ✍ Find x .

Question 15

(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.

Question 16

(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 $3x - y + 2 = 0$.

Question 17

- (b) (i) Factorise $25x^2 - 36y^2$.
- (ii) Factorise $11x^2 + 75x - 14$.
- (iii) ✍ Simplify $(3 - 4x)^2 - (3 - 5x)^2$.

Question 18

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

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

Question 19

- (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

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

Question 20

- (c) A survey of 40 students was carried out to find how many owned an MP3 player, a digital camera or a CD player.
- 1 student does not own any of these.
- x students own all three, while $2x$ own an MP3 player and a digital camera but not a CD player.
- 10 own an MP3 player and a CD player, while 11 own a digital camera and a CD player.
- 22 own an MP3 player, 22 own a digital camera and 24 own a CD player.
- (i) ✍ Construct a Venn diagram and solve for x .
- (ii) ✍ Hence, calculate the percentage of students who own one item only.

Question 21

(b) (i) ✍ Factorise $6c + 12bd - 8d - 9bc$.

(ii) ✍ Simplify

$$(7x - 2)(7x + 2) - (5y - 2)(5y + 2)$$

and fully factorise the simplified expression.

Question 22

(c) The distance from town A to town B is half the distance from town B to town C. The total journey from town A to town C, through town B, is 60 km.

A car travels at x km/h from town A to town B. It increases its speed by 20 km/h on the journey from town B to town C.

The total time for the journey is 50 minutes.

✍ Find the value of x .

Question 23

(c) (i) ✍ Solve the equation $3a^2 + 5a = 2$.

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

$$3\left(\frac{1}{t}\right)^2 + 5\left(\frac{1}{t}\right) = 2.$$

(iii) ✍ Verify your values for t from part (ii), above.

Question 24

(b) (i) ✍ Simplify

$$\frac{2x^2 + 4x - 30}{x - 3}.$$

Question 25

4. (a) ✍ When $x = \frac{1}{3}$, find the value of $\frac{3}{x+1} + \frac{4}{x+5}$.

Question 26

5. (a) ✍ Graph on the number line the solution set of

$$-98 \leq 10 - 12x, x \in \mathbf{N}.$$

Question 27

- (ii) ✍ Simplify $(\sqrt{6} - 2\sqrt{3})(5\sqrt{3} - 3\sqrt{6})$,

without the use of a calculator.

Express your answer in the form $a\sqrt{2} + b$, where $a, b \in \mathbf{Z}$.

Question 28

- (b) (i) ✍ By putting the smallest number first, place the following numbers in

order: $\frac{10}{7}$, $\sqrt{2}$, $\frac{7}{2\sqrt{6}}$, $(1 \cdot 19)^2$.

Question 29

- (b) 70 teenagers responded to a survey about holiday destinations.

30 had travelled to France,

26 had travelled to Spain

and 28 had travelled to Italy.

12 had travelled to both France and Spain,

8 had travelled to both Spain and Italy,

while x had travelled to France and Italy only.

4 teenagers had travelled to all three countries.

Twice as many had never travelled to any of these destinations as had travelled to France and Italy only.



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

- (ii) ✍ Find the number of teenagers who had travelled to France only.

Question 30

- (c) A farmer must feed bales of hay to his cattle for a total of 90 days.
He feeds the cattle 540 bales of hay over a number of days.
Their average consumption over this period is x bales per day.

(i) Write an expression in x for the number of days taken to consume the 540 bales.

If the average consumption is increased by 1 bale per day, then the cattle consume 300 bales in the remaining days.

(ii) Write an expression in x for the number of days taken to consume the 300 bales.

(iii) Using the above information, write an equation in x .

(iv) ✎ Solve this equation to find the value of x and the number of days taken to consume the first 540 bales.

Question 31

5. (a) The temperature on Sunday is x° .

The temperature rose by 3° each day for the next two days.

The temperature then dropped by 4° each day for the next three days.



✎ Derive an expression in x for the temperature on the fifth day (i.e. Friday).

Question 32

(ii) Factorise $9x^2 - 16y^2$.

Question 33

(b) (i) ✎ Factorise $2l - kl + km - 2m$.

(ii) Factorise $6x^2 - 19x + 10$.

(iii) Factorise $17x - 5x^2$.

Question 34

- (c) (i) ✍ Express in its simplest form:

$$\frac{1}{2x-3} - \frac{1}{2x+3}$$

- (ii) ✍ Hence, or otherwise, solve the equation:

$$\frac{1}{2x-3} - \frac{1}{2x+3} = \frac{6}{7}, \quad x \in \mathbf{Z}.$$

Question 35

- (b) (i) ✍ Solve $x^2 - 4x - 8 = 0$, giving your answer in the form

$$a \pm a\sqrt{b}, \text{ where } a, b \in \mathbf{N}.$$

Question 36

- (ii) ✍ A tourist paid \$4620 to a travel agent for a holiday in Ireland, where €1 = \$1.32. The cost to the travel agent of organising the holiday was €2985. Calculate, in euro, the profit made by the travel agent.



Question 37

(c) A box of drinking chocolate powder costs €3 · 60.

- (i) If the box contains x grams of powder, write an expression in x to represent the cost of 1 gram of the powder.



During a promotion, the manufacturer adds in to the box an extra 30 grams of powder.

The cost of the box of drinking chocolate remains at €3 · 60.

- (ii) Write an expression in x to represent the cost of 1 gram of the powder during the promotion.

Each gram of powder, in this case, now costs 1 cent less.

- (iii) Write an equation in x to represent the above information.

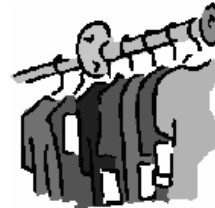
- (iv) ✍ Solve this equation to find how many grams of powder are in the box during the promotion.

Question 38

5. (a) Seven shirts and two sweaters cost €202 · 50.

A sweater costs the same as four shirts.

- ✍ Find the cost of one shirt.



Question 39

(b) In a school of 430 students, 250 students study History, 240 students study Geography.

Let x represent the number of students who study neither History nor Geography.

The number of students who study both History and Geography is 3 times the number who study neither of these subjects.

- (i) ✍ Represent this information on a Venn diagram.

- (ii) ✍ Write down and simplify an expression in x for the total number of students in the school.

- (iii) ✍ Use this expression to find the number of students who study neither History nor Geography.

Question 40

- (b) (i) Factorise $3x^2 + 8x - 3$.
- (ii) ✍ Factorise $3p - c + 3pc - c^2$.
- (iii) ✍ Simplify $(2x - 1)^2 - (x - 1)^2$.

Question 41

- (c) (i) ✍ Express in its simplest form:

$$\frac{1}{x-1} + \frac{1}{x+1}$$

- (ii) ✍ Hence, or otherwise, solve the equation:

$$\frac{1}{x-1} + \frac{1}{x+1} = 3$$

Express your answer in the form $a \pm b\sqrt{10}$, where $a, b \in \mathbf{Q}$.

Question 42

4. (a) ✍ Let f be the function $f: x \rightarrow x^2 + x - 7$, $x \in \mathbf{R}$.
Find $f(-3)$.

Question 43


- (c) €2000 was invested at $r\%$ for 2 years compound interest.
A tax of 25% was deducted each year from the interest gained.
At the end of the first year the investment amounted to €2030, after tax was deducted.
- (i) ✍ Calculate the rate of interest $r\%$.
- (ii) ✍ Find the amount of the investment at the end of 2 years, after tax has been deducted.

Question 44

- (b) A builders' supplier sells two types of copper pipes.
One has a narrow diameter and costs € x per length.
The other has a wider diameter and costs € y per length.



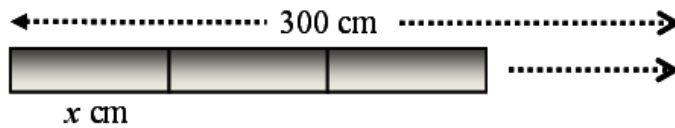
Tony buys 14 lengths of the narrow diameter pipes and 10 lengths of the wider diameter pipes at a cost of €555.
Gerry buys 12 lengths of the narrow diameter pipes and 5 lengths of the wider diameter pipes at a cost of €390.



- (i) Write two equations to represent the above information.
(ii)  Solve these equations to find the cost of a length of each type of copper pipe.

Question 45

- (c) Rectangular tiles are to be placed side by side on a wall.
Each tile has a length of x cm.

$\frac{300}{x}$ of these tiles are required.



- (i) If each tile was 1 cm longer, write down an expression in x for the number of tiles that would now be required.
(ii) If the longer tiles were used, the number of tiles required would decrease by 10.
 Write an equation in x to represent this information.
(iii)  Solve this equation to find the value of x .

Question 46

- (c) (i) ✍ Express in its simplest form:

$$\frac{3}{x+1} - \frac{2}{x+4}.$$

- (ii) ✍ Hence, or otherwise, solve the equation:

$$\frac{3}{x+1} - \frac{2}{x+4} = \frac{1}{3},$$

giving your answers in the form $a \pm b\sqrt{b}$, where $a, b \in \mathbf{N}$.

Question 47

- (c) Let f be the function $f: x \rightarrow -x^2 - 4x + 5$, $x \in \mathbf{R}$.

- (i) ✍ Find the co-ordinates of the points where the graph of $f(x)$ cuts the x -axis.

- (ii) ✍ Solve $f(x) = f(x+1)$.

Question 48

- (b) (i) Factorise $x^2 - 1$.

- (ii) ✍ Factorise fully $ax - 3 - a + 3x$.

- (iii) Factorise $6x^2 + x - 35$.

Question 49

- (c) The new Lansdowne Road stadium has seating capacity for 200 journalists. It was decided initially that this seating would be in x rows of equal value.
- (i) Write, in terms of x , the number of seats per row required to accommodate the 200 journalists.

During the construction it was decided to have 3 fewer rows to accommodate the 200 journalists.

- (ii) Write, in terms of x , the number of seats per row now required.

It was found that 15 extra seats per row were required compared to the initial plan.

- (iii) ✍ Write an equation using the above information and solve for x .



Question 50

- (b) (i) ✍ Divide $3x^2 + 5x - 28$ by $x + 4$.

- (ii) ✍ Solve the equation $\frac{4x+2}{5} - \frac{6-x}{3} = -5$.

Question 51

6. (a) ✍ When $a = \frac{1}{4}$, find the value of $\frac{a+5}{3} - \frac{a+4}{2}$.

(b) (i) ✍ Express in its simplest form:

$$\frac{4}{x-1} - \frac{5}{x+2}.$$

(ii) ✍ Hence, or otherwise, solve the equation:

$$\frac{4}{x-1} - \frac{5}{x+2} = \frac{3}{2},$$

giving your answers correct to one decimal place.

Question 52

4. (a) ✍ Graph on the number line the solution set of

$$-2x + 1 > -7, x \in \mathbb{N}.$$