



Mathematics Challenge 2015

by

Children's Well-wishers Network (CWN)

YEAR 7

45 minutes

Do **NOT** open this booklet until instructed

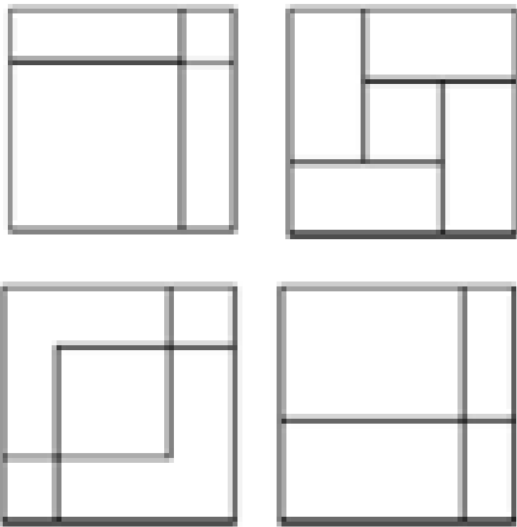
Calculators must **NOT** be used



- Write your **name** and **candidate number** in the spaces provided at the top of the page.
- You have 45 minutes for this paper which is worth 50 marks.
- Write your answers in pencil. Do NOT use a pen.
- Answer all 25 questions, attempting them in order and writing your answers clearly.
- If you find that you cannot answer a question straight away leave it blank and move on to the next question. Return to it later if you have time.
- Wherever applicable answers should carry units.
- Scrap paper is available on request.

For Examiner's use only	
Question No.	Score
Q1	/ 2
Q2	/ 5
Q3	/ 3
Q4	/ 2
Q5	/ 1
Q6	/ 1
Q7	/ 1
Q8	/ 2
Q9	/ 1.5
Q10	/ 1
Q11	/ 1
Q12	/ 1
Q13	/ 4
Q14	/ 1
Q15	/ 2.5
Q16	/ 2.5
Q17	/ 1.5
Q18	/ 1.5
Q19	/ 1
Q20	/ 1
Q21	/ 2.5
Q22	/ 2.5
Q23	/ 3.5
Q24	/ 3
Q25	/ 2
Total	/ 50

Q1) Express $(a + b)^2$ in four different ways using these diagrams.



where:

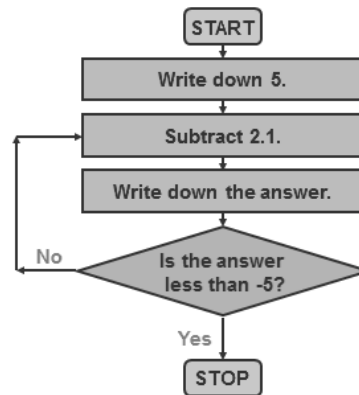
a represents the small part of the length,
b represents the larger part of the length

- $(a + b)^2 =$ _____
- $(a + b)^2 =$ _____
- $(a + b)^2 =$ _____
- $(a + b)^2 =$ _____

(2 marks)

Q2)

(a) Generate a sequence using the instructions:



(1 mark)

(b) In this generation we get a finite sequence. How can we change the instructions so that it would generate a new infinite sequence?

Change needed:

(1 mark)

(c) Complete the position-to-term rule to express the new generation.

$n \rightarrow$ _____

(1 mark)

(d) Write the two simultaneous rules (initiation and term-to-term) to express the new generation.

Initiation Rule: _____

Term-to-term Rule 2: _____

(2 marks)

Q3) Ram made a deposit of £ x in a bank. The bank gives him 2 % annual interest. He doesn't want to withdraw any money.

(a) What would be the expression for working out the account balance after a year of deposit?

Write it as a **product**.

(1 mark)

(b) What would be the expression for working out the account balance after two years of deposit?

Write it using **power notation**.

(1 mark)

(c) What would be the expression for working out the account balance after n years of deposit?

Express it in **power notation**.

(1 mark)

Q4)

(a) If you have to cut a piece of string into 14 equal pieces, and each cut takes 1 second, how long should the whole job take?

(1 mark)

(b) If 6 cats can catch 6 rats in 6 minutes, how many cats are needed to catch 10 rats in 10 minutes?

(You may assume the rate of rats killed per minute by one cat is constant.)

(1 mark)

Q5) Look at the conversation below between John and Bill.

John says:

"But isn't it the case that 50 per cent of your committee members are ready to accept this proposal now?"

Bill says:

"That's not the case at all - quite the reverse in fact."

Explain what is wrong with Bill's statement.

(1 mark)

Q6) Numeral means a symbol or group of symbols used to express a number, for example: 6 (Arabic), VI (Roman), and 110 (binary).

Express 49 in Roman numerals.

(1 mark)

Q7) Which of these two events are mutually exclusive? Cross out the inappropriate answer.

Picking one card from a standard deck and:

i. choosing an ace or a king

Answer: **Mutually exclusive / Not mutually exclusive**

(½ mark)

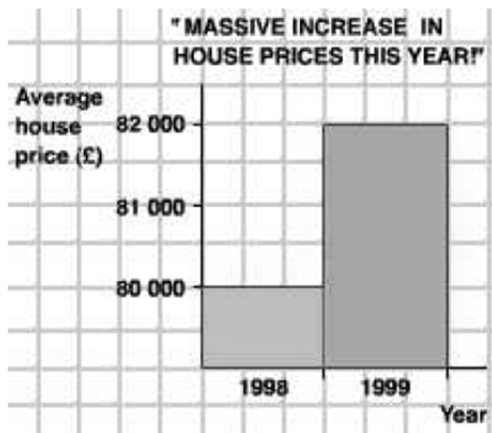
ii. choosing a red card or a king

Answer: **Mutually exclusive / Not mutually exclusive**

(½ mark)

Q8)

(a) Why does the bar chart below mislead?



(1 mark)

(b) What is wrong or missing on the graph below?



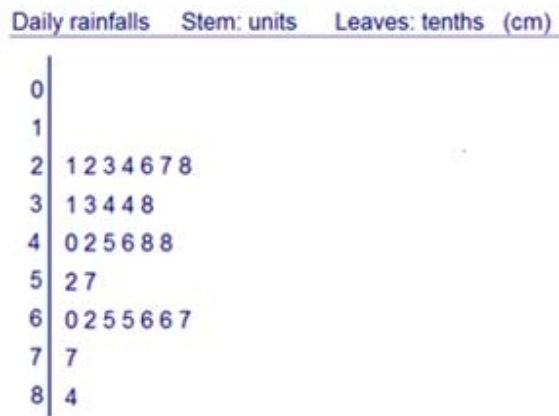
Give two answers.

1. _____

2. _____

(1 mark)

Q9) A stem-and-leaf diagram of daily rainfalls of a month is shown below.



(a) Which month could it be?

(½ mark)

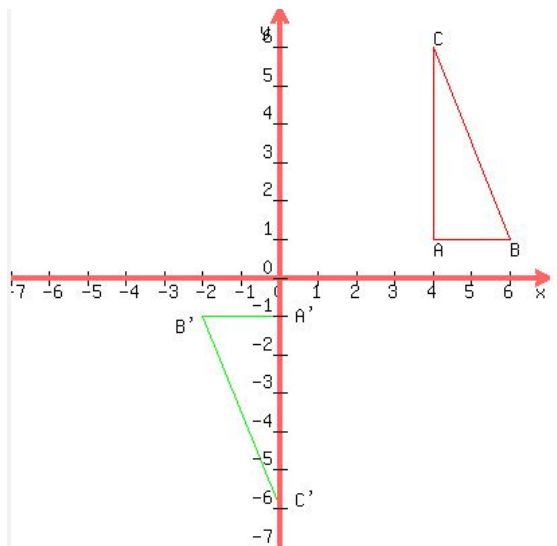
(b) What is the range of rainfall?

(½ mark)

(c) What is the median rainfall?

(½ mark)

Q10) Describe fully the single transformation from shape ABC to shape A'B'C'.

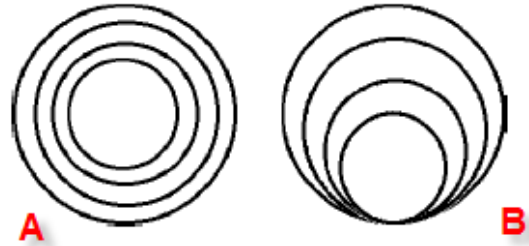


(1 mark)

Q11) The value of a £400,000 flat increased by 10% in June. Its new value increased by a further 10% in October. What was its value in November?

(1 mark)

Q12) Which picture contains more white space?



Answer: _____

(½ mark)

Explain your reason(s).

(½ mark)

Q13)

(a) Show that 4,938,449,472 is divisible by 792.

(1 mark)

(b) Relate composite numbers with prime numbers.

(1 mark)

(c) Do you accept that 1 is not a prime number? Why?

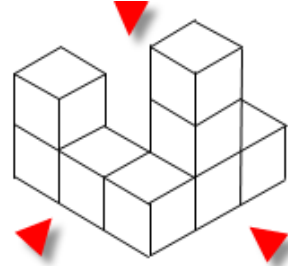
(1 mark)

(d) 8, 9, 11 are **pairwise coprime**. Why?

(1 mark)

Q14) Draw the plan, front and right side elevations of the object shown below.

(You need indicate plan, front, and side view below)



(1 mark)

Q15)

(a) A DVD costs £20. What will happen if the price increases by 50%?

(½ mark)

(b) By what percentage does this new price need to decrease to return to the original price £20?

(1 mark)

(c) Will your answer to (b) work for all initial prices, i.e. not only for £20?

(½ mark)

Why? Explain.

(½ mark)

Q16) Raman planned to make cakes with cream as follows.

Number Cakes	3	6	9	12	15
Cream (grams)	1.5	3	4	6	7.5

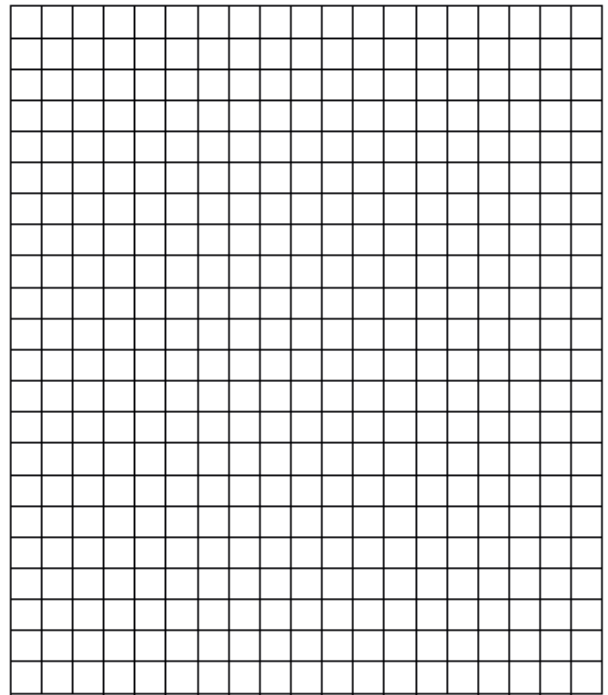
Seetha said the relationship shown above is not proportional.

Raman looked up again and changed an amount of cream in his plan to make the figures were proportional.

(a) Which value did he change and what was the new value?

(½ mark)

(b) Show the relationship between number of cakes and amount of cream in the grid follows:

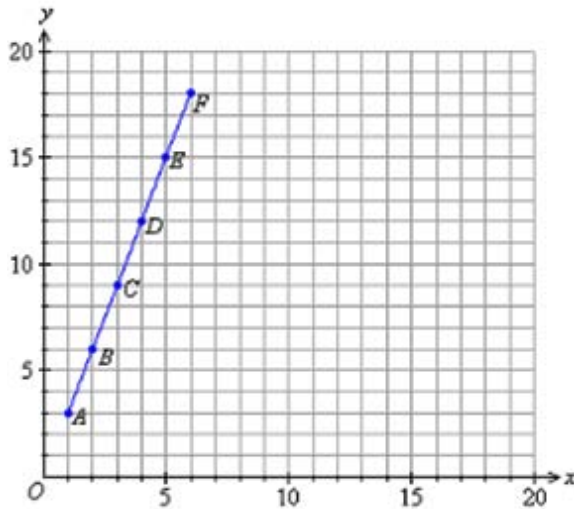


(1 mark)

(c) Show the relationship as a discrete equation using:
n for number of cakes,
m for the amount of cream.

(1 mark)

Q17) Use the following graph answer the questions below.



(a) Does this graph show a proportional relationship?

(½ mark)

Explain your answer.

(½ mark)

(b) What is the equation of the line?

(½ mark)

Q18)

(a) There are 250 children and some teachers going on a theatre trip.

They need to travel from the school to the theatre in vans.

The accompanying teachers and the driver have their own seats. Each van can carry 6 children.

How many vans will be needed?

(½ mark)

(b) I have saved £1500 to buy an annual travelcard that costs £1400.

A single day anytime travelcard for unlimited travel costs £5.

I work on all weekdays 52 weeks a year, including public holidays.

(i) Can I afford an annual travelcard? Justify your answer.

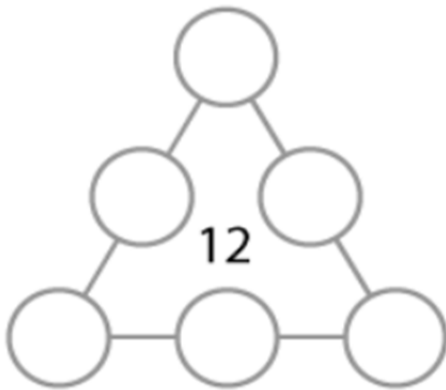
(½ mark)

(ii) Is it advisable to buy an annual travelcard? Give your reason(s).

(½ mark)

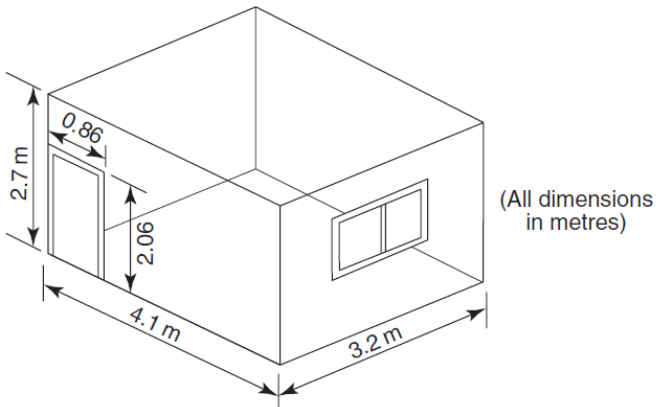
Q19) Complete the triangle below using the following constraints:

- When you add the numbers on each side of the triangle you should get the middle number 12.
- You can only use the integers from 1 up to 6.



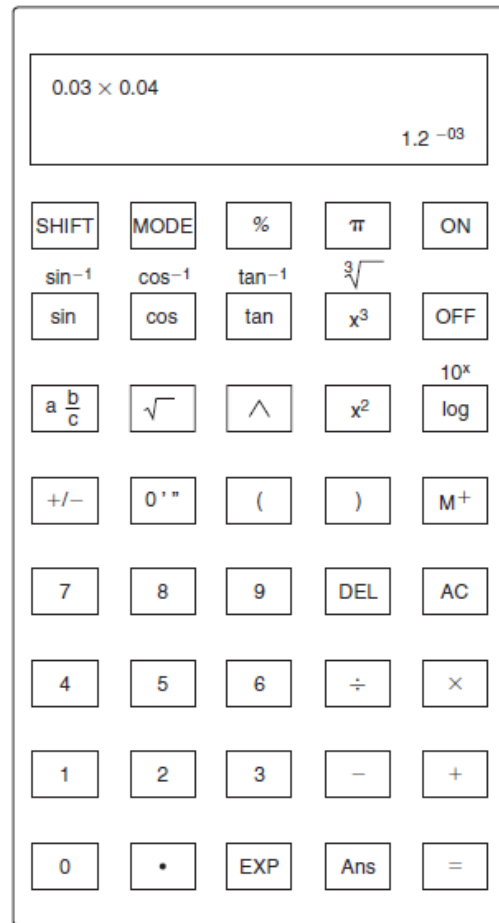
(1 mark)

Q20) Calculate the length of skirting board required for the room below:



(1 mark)

Q21)



(a) Does this calculator show the correct answer to 0.03×0.04 as 1.2×10^{-03} ?

(½ mark)

(b) Which buttons would you press to enter 1.2×10^{-3} in the calculator?

(1 mark)

(c) Convert the answer shown on the calculator to decimals.

($\frac{1}{2}$ mark)

(d) In what mode is the calculator set now?

($\frac{1}{2}$ mark)

Q22) During one evening after school Thevi devoted two-fifths of her time to Volleyball, three-twentieths of her time on worshipping gods, a third of her time having dinner and taking a bath, and the remaining 42 minutes chatting on her mobile phone. Afterwards she goes straight to bed.

(a) How much time did she spend on studying Mathematics?

($\frac{1}{2}$ mark)

(b) If she comes back from school by 3p.m. What time did she go to bed?

(2 marks)

Q23) The following bar graph is the result of an honest poll conducted on parents to find how their children spend their time, in a town called Mundaasuppaddi, using a local postal questionnaire.

Schooling	■	■	■	■	■	■	■	■	■
Playing Football and other games	■	■	■	■	■	■	■	■	■
Chatting with friends	■	■	■	■	■	■	■	■	■
Attending Social get-togethers	■	■	■	■	■	■	■	■	■
Spending time on religious functions	■	■	■	■	■	■	■	■	■
Helping parents	■	■	■	■	■	■	■	■	■
Doing Home work	■	■	■	■	■	■	■	■	■

(a) What was the probability that the children are keen in doing homework assuming the whole population of Mundaasuppaddi gave an answer to the poll?

($\frac{1}{2}$ mark)

(b) Give a reason why most polls conducted are biased.

(1 mark)

(c) What was wrong with the above poll? Give two answers.

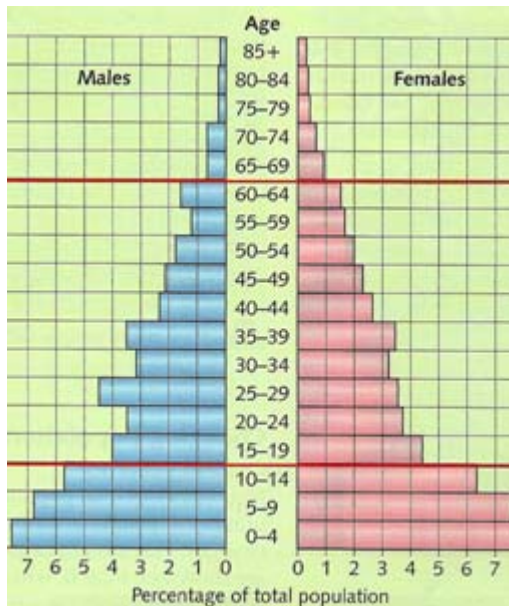
1. _____

2. _____

(2 marks)

Q24) The following diagram is the population pyramid of a country. Using this evidence:

- Insert tick (✓) for the correct statements in the box.
- If an answer cannot be predicted insert a question mark (?) in the box.
- Insert a cross (X) for the incorrect statements in the box.
- Leave blank if you could not attempt the question.



- There are few older people who are elderly dependents.
- A narrow top on the pyramid means a short life expectancy.
- A few people in 30-65 age groups are economically active.
- Narrowing pyramid shapes show decreasing numbers in each group.
- A wide base indicates high death rate.
- A high proportion of people are below 15.

(3 marks)

Q25)

(a) Which circle is bigger: a circle with an area of π square units or one with a circumference of π units? Give your reason(s).

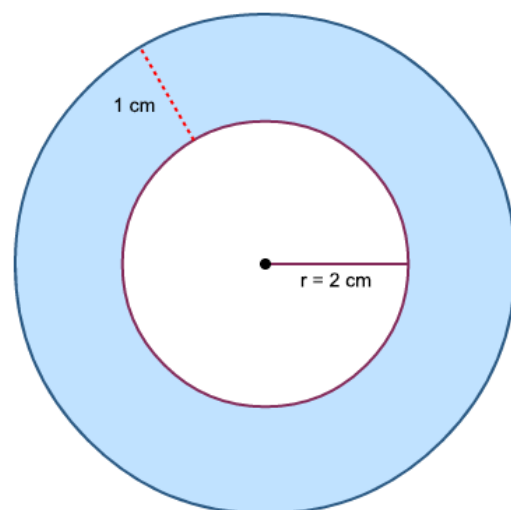
(1 mark)

(b) Which grows faster: the area of a circle or its circumference, assuming the radius is greater than 2?

(½ mark)

(c) Both circles below have the same centre. What is the area of the shaded region?

Express your answer as a multiple of π .



Answer: _____

(½ mark)