2.15 Logic and Puzzle Problems: Test Pack

GL ASSESSMENT GL11-MATHS-LOGIC · Calculators not allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A rule connects pairs of numbers: 3 is linked to 11, and 5 is linked to 21.

(a) Find the rule connecting the number n to its linked value, giving your answer in the form an+b. **(2)**

.....

(b) Using your rule, find the value linked to 8. **(1)**

.....

(c) Find the value of n whose linked value is 56. **(2)**

.....

2 There are 8 identical-looking coins, but one of them is a fake that is lighter than the rest. You have a balance scale and may use it only twice.

(4)

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3 On an island, Knights always tell the truth and Knaves always lie. You meet two islanders, X and Y. X says: 'At least one of us is a Knave.'

(3)

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4 If 15th July 2026 falls on a Wednesday, what day of the week is 2nd August 2026?

(3)

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5 In a code, every letter is replaced by the letter 3 places later in the alphabet (A becomes D, B becomes E, and so on), wrapping round so X becomes A, Y becomes B and Z becomes C.

(a) Decode the word PDWKV. **(2)**

(b) Use the same code to encode the word PUZZLE. **(2)**

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6 Six friends - Priya, Jamal, Sofia, Tom, Aisha and Ben - sit at a round table with six evenly spaced seats, numbered 1 to 6 clockwise. Seats directly opposite each other differ by 3 (for example, seat 1 is opposite seat 4). Use these clues: (1) Sofia is directly opposite Tom. (2) Priya sits immediately clockwise of Sofia. (3) Ben sits immediately anticlockwise of Tom. (4) Aisha sits immediately clockwise of Tom. (5) Jamal is not seated immediately next to Priya.

(a) Complete the seating order, listing all six friends clockwise starting from Sofia. **(3)**

(b) State who sits directly opposite Jamal. **(1)**

(c) State who sits immediately anticlockwise of Aisha. **(1)**

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7 Five children are different heights. Sienna is shorter than Megan. Ravi is shorter than Sienna. Ravi is taller than Oliver. Callum is taller than Megan. Who is the shortest?

- ☐ A) Ravi
- ☐ B) Sienna
- ☐ C) Megan
- ☐ D) Callum
- ☐ E) Oliver

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8 Look at the number sequence: 3, 7, 11, 15, ...

(a) State the rule used to get from one term to the next. **(1)**

(b) Write down the next two terms of the sequence. **(2)**

.....

9 Amelia is taller than Ben. Ben is taller than Chloe. Is Amelia taller than Chloe? Explain your answer.

(2)

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Mark scheme · 2.15 Logic and Puzzle Problems: Test Pack

Question 1

(a) set up 3a+b=11 and 5a+b=21 and solve simultaneously (oe) **M1**

(a) rule 5n-4 cao **A1**

(a) Answer: 5n-4

(b) 36 cao (ft from a) **B1**

(b) Answer: 36

(c) 5n-4=56 (ft from a) **M1**

(c) n=12 cao **A1**

(c) Answer: 12

Question 2

split coins into groups of 3, 3 and 2 (oe) **B1**

weigh the two groups of 3 against each other; if they balance, the fake is one of the remaining 2 (oe) **B1**

if the groups of 3 do not balance, take the lighter group of 3 and weigh 2 of those against each other (oe) **B1**

correct conclusion in both branches: if that final pair balances the untested coin is fake, otherwise the lighter coin shown is fake (oe) **B1**

Answer: Split into 3, 3 and 2. Weigh the two groups of 3: if balanced, weigh the remaining 2 coins against each other and the lighter one is fake; if unbalanced, take the lighter group of 3 and weigh 2 of them against each other - if they balance the third coin is fake, otherwise the lighter one shown is fake

Question 3

test the case X is a Knave: the statement would then be false, meaning neither is a Knave, which contradicts X being a Knave (oe) **M1**

conclude X must be a Knight cao **A1**

since X (a truthful Knight) says at least one is a Knave, and X is not, conclude Y is a Knave cao **A1**

Answer: X is a Knight and Y is a Knave

Question 4

find the number of days from 15 July to 2 August: (31-15)+2=18 (oe) **M1**

18 divided by 7 leaves remainder 4 (oe) **M1**

Sunday cao **A1**

Answer: Sunday

Question 5

(a) shift each letter back 3 places (oe) **M1**

(a) MATHS cao **A1**

(a) Answer: MATHS

(b) shift each letter forward 3 places (oe) **M1**

(b) SXCCOH cao **A1**

(b) Answer: SXCCOH

Question 6

(a) place Sofia, Tom opposite (seat 1 and seat 4), Priya at seat 2, Ben at seat 3 (oe) **M1**

(a) place Aisha at seat 5, leaving Jamal at seat 6 (oe) **M1**

(a) Sofia, Priya, Ben, Tom, Aisha, Jamal cao **A1**

(a) Answer: Sofia, Priya, Ben, Tom, Aisha, Jamal

(b) Ben cao (ft from a) **B1**

(b) Answer: Ben

(c) Tom cao (ft from a) **B1**

(c) Answer: Tom

Question 7

correct option E (Oliver) cao **B1**

Answer: E) Oliver

Question 8

(a) add 4 to the previous term (oe) **B1**

(a) Answer: Add 4 each time

(b) 19 cao **B1**

(b) 23 cao **B1**

(b) Answer: 19, 23

Question 9

Yes (cao) **B1**

valid reasoning, e.g. Amelia is taller than Ben, and Ben is taller than Chloe, so Amelia must be taller than Chloe (oe) **B1**

Answer: Yes, Amelia is taller than Chloe

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