APSMO

WEDNESDAY 6 MAY 2026

MATHS GAMES

SENIOR

Suggested Time: ***30 Minutes.*** *Calculators NOT Permitted.*

Write your answers in the boxes on the back.

←

Keep your answers hidden by folding backwards on this line.

1A. Suppose today is Wednesday.

What day of the week will it be in 100 days' time?

1B. Bernard is finding prime numbers between 10 and 50.

He begins by listing all of the numbers between 10 and 50, and eliminating all of the multiples of 2.

He continues by eliminating multiples of 3, 5, and 7.

How many numbers remain on his list?

1C. Kirpa is making a number pattern, as follows:

- If the current number is odd, then double it.
- If the current number is even, halve it and add 1.

Kirpa uses 7 as her first number. Her first answer is 14.

She then continually runs through the procedure for every answer she gets.

What is the 20th answer she calculates?

1D. Anne, Eliza, Ingrid and Olivia all have ages that are different square numbers.

Ingrid is 15 years older than Olivia.

Anne is 15 years older than Eliza.

What is the positive difference between Anne's age and Ingrid's age?

1E. Find the value of the expression:

$1 - 2 + 3 - 4 + 5 - 6 + 7 - 8 + \ldots + 2023 - 2024 + 2025 - 2026.$

Copyright © 2026 Australasian Problem Solving Mathematical Olympiads (APSMO) Inc. All rights reserved.

APSMO

WEDNESDAY 6 MAY 2026

MATHS GAMES

SENIOR

1A.

1B.

1C.

1D.

1E.

Student Name:

Fold here. Keep your answers hidden.

Copyright © 2026 Australasian Problem Solving Mathematical Olympiads (APSMO) Inc. All rights reserved.

APSMO

WEDNESDAY 6 MAY 2026

MATHS GAMES

SENIOR

Suggested Time: ***30 Minutes.*** *Calculators NOT Permitted.*

Write your answers in the boxes on the back.

←

Keep your answers hidden by folding backwards on this line.

1A. Suppose today is Wednesday.

What day of the week will it be in 100 days' time?

Hint: What day of the week will it be in 7 days' time?

1B. Bernard is finding prime numbers between 10 and 50.

He begins by listing all of the numbers between 10 and 50, and eliminating all of the multiples of 2.

He continues by eliminating multiples of 3, 5, and 7.

How many numbers remain on his list?

Hint: You could draw a table.

1C. Kirpa is making a number pattern, as follows:

- If the current number is odd, then double it.
- If the current number is even, halve it and add 1.

Kirpa uses 7 as her first number. Her first answer is 14.

She then continually runs through the procedure for every answer she gets.

What is the 20th answer she calculates?

Hint: Try to find a pattern.

1D. Anne, Eliza, Ingrid and Olivia all have ages that are different square numbers.

Ingrid is 15 years older than Olivia.

Anne is 15 years older than Eliza.

What is the positive difference between Anne's age and Ingrid's age?

Hint: What values are possible for Ingrid's age?

1E. Find the value of the expression:

$1 - 2 + 3 - 4 + 5 - 6 + 7 - 8 + \ldots + 2023 - 2024 + 2025 - 2026.$

Hint: Work through the expression until you find a pattern.

Copyright © 2026 Australasian Problem Solving Mathematical Olympiads (APSMO) Inc. All rights reserved.

APSMO

WEDNESDAY 6 MAY 2026

MATHS GAMES

SENIOR

1A.

1B.

1C.

1D.

1E.

Student Name:

Fold here. Keep your answers hidden.

Copyright © 2026 Australasian Problem Solving Mathematical Olympiads (APSMO) Inc. All rights reserved.

APSMO
WEDNESDAY 6 MAY 2026

MATHS GAMES

MATHS GAMES
SENIOR

Solutions and Answers
(Items in parentheses are not required)

1A: Friday	**1B:** 11	**1C:** 6	**1D:** 48	**1E:** –1013

1A. What day of the week will it be in 100 days' time?

***Strategy:* Build a Table, and Find a Pattern**

Today is Wednesday.

In **1** day's time, it will be Thursday.

In **7** days' time, it will be Wednesday again.

Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1	2	3
4	5	6	7			

After another **7** days, it will be Wednesday again.

Every Wednesday will occur on a day that is a multiple of **7**.

Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24

Method 1: Find a multiple of 7 that is close to 100.

We might recall that **7 × 7 = 49**, and so day **49** is a Wednesday.

Another **49** days later, the **49 + 49 = 98**th day will also be a Wednesday.

Day **100** is another **2** days later, so day **100** is a **Friday**.

Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
			...			
			49			
			...			
			98	99	100	

Method 2: Use a well-known multiple of 7.

10 × 7 = 70, and so day **70** is a Wednesday.

The following Wednesdays will occur on days **77**, **84**, **91**, and **98**.

Day **100** is another **2** days later, so day **100** is a **Friday**.

Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1	2	3
4	5	6	7	8	9	10
			...			
			70			
			77			
			84			
			91			
			98	99	100	

Method 3: Use a division algorithm.

We can find the remainder after dividing **100** by **7**.

$$\begin{array}{r} 14 \\ 7\overline{)100} \\ -\,70 \\ \hline 30 \\ -\,28 \\ \hline 2 \end{array}$$

After dividing by **7**, there is a remainder of **2**.

Since every **7**th day is a Wednesday, the **100**th day will be **2** days after Wednesday.

The **100**th day is a **Friday**.

Follow-Up: *What day of the week will it be in 700 days' time?* [Wednesday]

Copyright © 2026 Australasian Problem Solving Mathematical Olympiads (APSMO) Inc. All rights reserved.

1B. How many numbers are left, after eliminating multiples of 2, 3, 5 and 7?

Strategy: **Build a Table, and Find a Pattern**

Bernard is identifying prime numbers between **10** and **50**.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50

He eliminates all of the multiples of 2,

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50

multiples of 3,

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50

multiples of 5, and

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50

multiples of 7.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50

Since **7 × 7 = 49**, if a number less than **49** is composite, it must have a factor that is less than **7**.

We have eliminated all of those numbers, so the remaining numbers are all prime.

The remaining numbers are:

11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47.

There are **11** numbers remaining.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50

Follow-Up: *How many prime numbers are there between 10 and 60?* [13]

Copyright © 2026 Australasian Problem Solving Mathematical Olympiads (APSMO) Inc. All rights reserved.

1C. What is the 20th number that Kirpa calculates?

Strategy: **Find a Pattern**

Kirpa's first number is **7**. She applies the procedure as follows:

Input: **7**	• If the current number is odd, then double it. • If the current number is even, halve it and add 1.	→	$2 \times 7 = 14$. Answer 1: **14**

The first answer she calculates is **14**.

She then runs through the procedure again for **14**, which is the answer she calculated.

Input: **14**	• If the current number is odd, then double it. • If the current number is even, halve it and add 1.	→	$14 \div 2 = 7$. $7 + 1 = 8$. Answer 2: **8**

The next answer she calculates is **8**.

She continually runs through the procedure again for every answer she calculates.

Input: **8**	• If the current number is odd, then double it. • If the current number is even, halve it and add 1.	→	$8 \div 2 = 4$. $4 + 1 = 5$. Answer 3: **5**
Input: **5**	• If the current number is odd, then double it. • If the current number is even, halve it and add 1.	→	$2 \times 5 = 10$. Answer 4: **10**
Input: **10**	• If the current number is odd, then double it. • If the current number is even, halve it and add 1.	→	$10 \div 2 = 5$. $5 + 1 = 6$. Answer 5: **6**
Input: **6**	• If the current number is odd, then double it. • If the current number is even, halve it and add 1.	→	$6 \div 2 = 3$. $3 + 1 = 4$. Answer 6: **4**
Input: **4**	• If the current number is odd, then double it. • If the current number is even, halve it and add 1.	→	$4 \div 2 = 2$. $2 + 1 = 3$. Answer 7: **3**
Input: **3**	• If the current number is odd, then double it. • If the current number is even, halve it and add 1.	→	$2 \times 3 = 6$. Answer 8: **6**

Since Answer 5 and Answer 8 are both **6**, the answers must loop.

Answer No.	1	2	3	4	5	6	7	8	9	10
Answer Value	14	8	5	10	6	4	3	6	4	3

The pattern "**6, 4, 3**" continues to repeat. Notice that the value calculated for answers **6, 9, 12,** etc. is **4**.

Answer No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Answer Value	14	8	5	10	6	4	3	6	4	3	6	4	3	6	4	3	6	4	3	6

The **20**th number that Kirpa calculates is **6**.

Follow-Up: *What is the 2000th number that Kirpa calculates?* [6]

Copyright © 2026 Australasian Problem Solving Mathematical Olympiads (APSMO) Inc. All rights reserved.

1D. What is the positive difference between Anne's age and Ingrid's age?

Strategy 1: **Build a Table**

All of the ages are square numbers.

We can use a table to list all of the square numbers that might possibly be someone's age.

Square Number	1	4	9	16	25	36	49	64	81	100	121

Ingrid is **15** years older than Olivia.

Anne is **15** years older than Eliza.

We can relabel our list of square numbers as possible ages for Eliza and Olivia, and add another row of possible ages for Anne and Ingrid.

Eliza / Olivia	1	4	9	16	25	36	49	64	81	100	121
Anne / Ingrid	16	19	24	31	40	51	64	79	96	115	136

We can see that there are exactly two possible ages for Anne and Ingrid that are also square numbers.

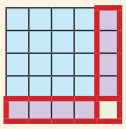
Eliza / Olivia	1	4	9	16	25	36	49	64	81	100	121
Anne / Ingrid	16	19	24	31	40	51	64	79	96	115	136

Anne and Ingrid must be **16** and **64**, in some order.

Either way, the positive difference between Anne's age and Ingrid's age is **64 – 16 = 48**.

Strategy 2: **Draw a Diagram**

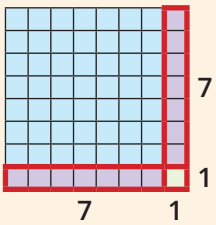
We can use a diagram to represent the difference between two consecutive square numbers.



The diagram shows that the difference is always going to be odd.

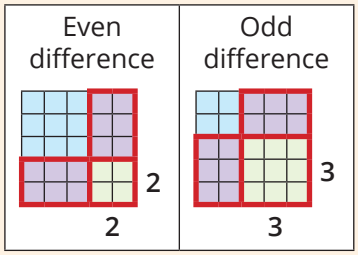
To create the larger square, the smaller square is increased by twice its side length, plus **1**.

There will be two consecutive square numbers where one is greater than the other by **7 + 7 + 1 = 15**.

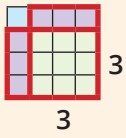


We now know that two of the people (say, Eliza and Anne) are aged **7 × 7 = 49** and **8 × 8 = 64.**

The parity of the difference between two square numbers depends on the parity of the bottom right square in our diagram.



Since our difference of **15** is odd, we might look for a square number that can include a bottom right square of size **3 × 3 = 9**.



From this diagram, we can see that Olivia and Ingrid are aged **1 × 1 = 1** and **4 × 4 = 16.**

Therefore the positive difference between Anne's age and Ingrid's age is **64 – 16 = 48**.

Follow-Up: *Ben, Fred, and Joe all have ages that are different square numbers. Joe is 24 years older than Fred. Fred is 24 years older than Ben. How old is Joe ?* [49]

Copyright © 2026 Australasian Problem Solving Mathematical Olympiads (APSMO) Inc. All rights reserved.

1E. Find the value of the expression: 1 – 2 + 3 – 4 + 5 – 6 + 7 – 8 + ... + 2023 – 2024 + 2025 – 2026.

Strategy 1: **Find a Pattern**

We can begin by working through the sum, as follows.

Expression	1	– 2	+ 3	– 4	+ 5	– 6	+ 7	– 8	+ 9	– 10	+ 11	– 12	+ 13	– 14
Sum so far	1	– 1	2	– 2	3	– 3	4	– 4	5	– 5	6	– 6	7	– 7

Suppose the last value of the expression is ***n***.

We can see that, when ***n*** is odd:

Expression	1	– 2	+ 3	– 4	+ 5	– 6	+ 7	– 8	+ 9	– 10	+ 11	– 12	+ 13	– 14
Sum so far	1	– 1	2	– 2	3	– 3	4	– 4	5	– 5	6	– 6	7	– 7

the value of the whole expression is $\frac{1}{2}(n + 1)$.

When ***n*** is even:

Expression	1	– 2	+ 3	– 4	+ 5	– 6	+ 7	– 8	+ 9	– 10	+ 11	– 12	+ 13	– 14
Sum so far	1	– 1	2	– 2	3	– 3	4	– 4	5	– 5	6	– 6	7	– 7

the value of the whole expression is $\frac{1}{2}(n)$.

The last value of the expression **1 – 2 + 3 – 4 + 5 – 6 + 7 – 8 + ... + 2023 – 2024 + 2025 – 2026** is **–2026**, which is even.

From the pattern we have identified, we can see that the value of the expression is $\frac{1}{2} \times -2026 = -1013$.

Strategy 2: **Find a Pattern (Alternative Approach)**

We can consider the values being added, and the values being subtracted, as separate expressions:

(1 + 3 + 5 + 7 + ... + 2023 + 2025) – (2 + 4 + 6 + 8 + ... + 2024 + 2026).

1 + 3 + 5 + 7 + ... + 2023 + 2025

= (1 + 2025) + (3 + 2023) + ... + (1011 + 1015) + 1013.

2 + 4 + 6 + 8 + ... + 2022 + 2024 + 2026

= (2 + 2024) + (4 + 2022) + ... + (1012 + 1014) + 2026.

We can see that the value of (1 + 2025) + (3 + 2023) + ... + (1011 + 1015)
is the same as the value of (2 + 2024) + (4 + 2022) + ... + (1012 + 1014).
Let's call this value ***n***.
The expression is therefore equal to $(n + 1013) - (n + 2026) = n + 1013 - n - 2026$
$= -1013$.

Follow-Up: *Find the value of the expression 2 – 4 + 6 – 8 + 10 – 12 + ... + 2022 – 2024 + 2026.* [1014]

Copyright © 2026 Australasian Problem Solving Mathematical Olympiads (APSMO) Inc. All rights reserved.