

Year 12 Maths Challenge 2010

Relay Round – A1

An arithmetic progression has a second term of 10 and a fifth term of 22.

Find the sum of the first ten terms.

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Relay Round – A2

T is the number that you will receive.

A geometric progression has a common ratio of a half and a first term T .

Find the difference between the fourth and fifth terms.

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Relay Round – A3

T is the number that you will receive.

Two consecutive square numbers have a difference of T .

Find the value of the smaller of the two square numbers.

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Relay Round – A4

A4 *T is the number that you will receive.*

Two consecutive triangle numbers have a difference of T .

Find the value of the smaller of the two triangle numbers.

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Relay Round – B1

The curve $y = x^2 + ax - 10$

has a gradient of 3 at $x = \frac{1}{2}$.

Find the value of a .

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Relay Round – B2

T is the number that you will receive.

Find the area under the curve $y = 3x^2 + 1$
between $x = 0$ and $x = T$.

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Relay Round – B3

T is the number that you will receive.

Find the value of:

$$\frac{(T^2 - 36)(T^2 + 4T - 12)}{(T^2 - 4T + 4)(T^2 + 8T + 12)}$$

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Relay Round – B4

T is the number that you will receive.

Calculate the value of:

$$\frac{64^T + 8^{1-T}}{9^{\frac{1}{T}}}$$

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Relay Round – C1

Let $a \otimes b = 2a + b + 1$

For example $3 \otimes 5 = 2 \times 3 + 5 + 1 = 12$

Solve the equation $1 \otimes (x \otimes 4) = 18$

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Relay Round – C2

T is the number that you will receive.

Given that T is a root of the equation

$$x^2 + ax - 40 = 0,$$

find the value of a .

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Relay Round – C3

T is the number that you will receive

Given that:

$$Tx + y + z = 2$$

$$Ty + z + x = 3$$

$$Tz + x + y = 5$$

Find the value of $x + y + z$.

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Relay Round – C4

T is the number that you will receive.

Find the value of

$$(T - \sqrt{T})^3$$

giving your answer in the form $a - b\sqrt{c}$, where a , b and c are integers.

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Relay Round – D1

A cone is enclosed in a sphere of radius R .

The radius of the base of the cone is R and the height of the cone is R .

How many times greater is the volume of the sphere than the volume of the cone?

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Relay Round – D2

T is the number that you will receive.

The line $y = mx + c$ passes through the point $(1,2)$ and is perpendicular to the line $x + Ty = 5$.

Find the value of c .

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Relay Round – D3

T is the number that you will receive.

A circle has the equation

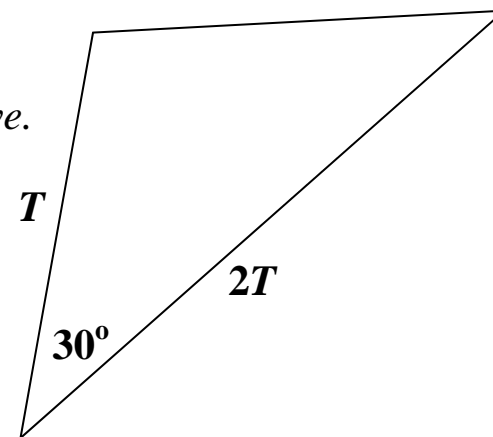
$$x^2 + 6Tx + y^2 + 8Ty = 0.$$

Find the radius of the circle.

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Relay Round – D4

A4 T is the number that you will receive.



Calculate the area of the scalene triangle.

Relay Round Answer/Marking Sheet (team copy)

	ANSWER	
Question A1		2 / 1 mark
Question A2		2 / 1 mark
Question A3		2 / 1 mark
Question A4		2 / 1 mark
A4 correct inside 4 mins		2 marks
	TOTAL (10)	

	ANSWER	
Question B1		2 / 1 mark
Question B2		2 / 1 mark
Question B3		2 / 1 mark
Question B4		2 / 1 mark
B4 correct inside 4 mins		2 marks
	TOTAL (10)	

	ANSWER	
Question C1		2 / 1 mark
Question C2		2 / 1 mark
Question C3		2 / 1 mark
Question C4		2 / 1 mark
C4 correct inside 4 mins		2 marks
	TOTAL (10)	

	ANSWER	
Question D1		2 / 1 mark
Question D2		2 / 1 mark
Question D3		2 / 1 mark
Question D4		2 / 1 mark
D4 correct inside 4 mins		2 marks
	TOTAL (10)	

SCHOOL

TOTAL for the Relay Round =

Relay Round Answer/Marking Sheet

	ANSWER	
Question A1	240	2 / 1 mark
Question A2	15 (allow -15)	2 / 1 mark
Question A3	49	2 / 1 mark
Question A4	1176	2 / 1 mark
A4 correct inside 4 mins		2 marks
	TOTAL (10)	

	ANSWER	
Question C1	5	2 / 1 mark
Question C2	3	2 / 1 mark
Question C3	2	2 / 1 mark
Question C4	20 - 14 ☆ 2	2 / 1 mark
C4 correct inside 4 mins		2 marks
	TOTAL (10)	

	ANSWER	
Question B1	2	2 / 1 mark
Question B2	10	2 / 1 mark
Question B3	2/3 or equivalent	2 / 1 mark
Question B4	2/3	2 / 1 mark
B4 correct inside 4 mins		2 marks
	TOTAL (10)	

	ANSWER	
Question D1	4	2 / 1 mark
Question D2	-2	2 / 1 mark
Question D3	10	2 / 1 mark
Question D4	50	2 / 1 mark
D4 correct inside 4 mins		2 marks
	TOTAL (10)	

TOTAL for the Relay Round = 40