

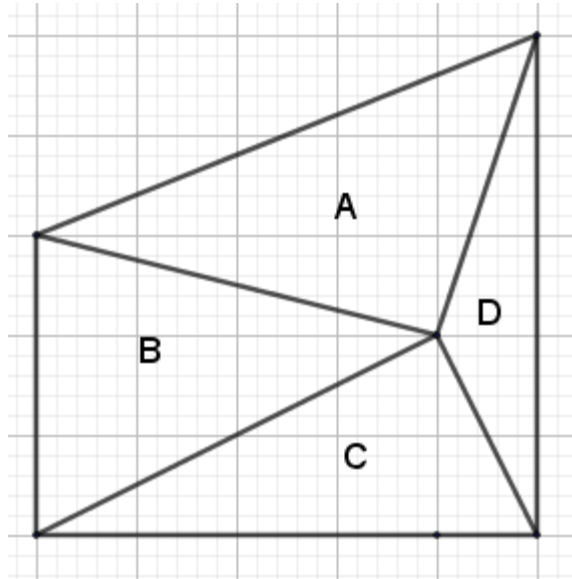


# KOMODO Maths Festival

## Sample Questions

Level: Salamander  
Pure Maths (2D Shapes)

See the following figure.



In the figure, we can see four shapes (A, B, C, D). Which shape has the SECOND biggest area?

Answer Choices:

- A. A
- B. B
- C. C
- D. D



# KOMODO Maths Festival

## Sample Questions

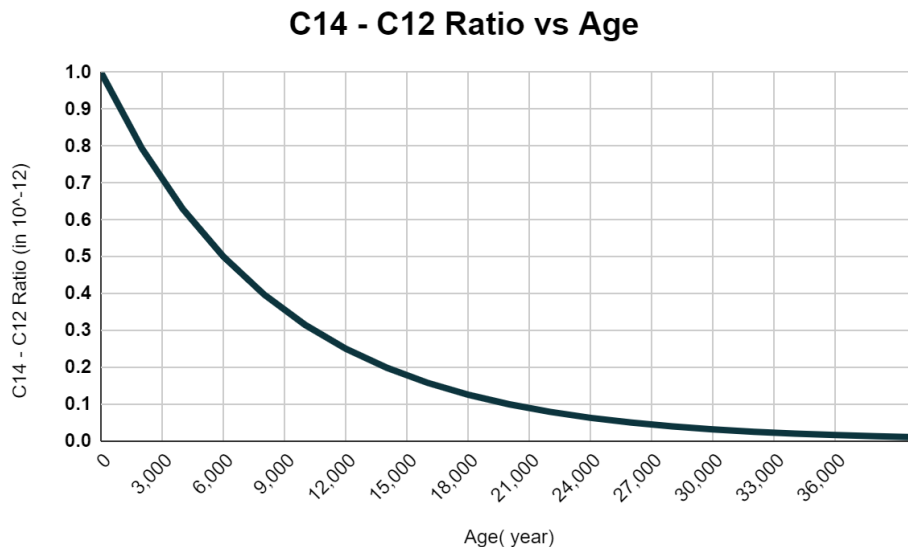
**Level: Salamander**

**Applied Maths (Word Problems)**

Carbon dating is a way to determine the age of a fossil. The way it works is by comparing the amount of carbon 14 (C-14) to carbon 12 (C-12) in the fossil.

The ratio between C-14 and C-12 in a living organism is  $10^{-12}$ : 1. After the organism dies and becomes a fossil, the amount of C-12 doesn't change, but the amount of C-14 decreases into half for every 6000 years. Therefore, the ratio between C-14 and C-12 decreases as the fossil age, and we can find how long it's been dead from this ratio.

You can use the following graph to see the relation between fossil age and C-12 to C-14 comparison in more detail.



Say we found a fossil of Smilodon, and do a carbon dating on that fossil. From the measurement we conclude that the C-12 to C-14 ratio in the fossil is  $0.15 \times 10^{-12}$ . What would be the rough estimate of its age?

- A. 4,000 years
- B. 8,000 years
- C. 16,000 years
- D. 32,000 years



# KOMODO Maths Festival

## Sample Questions

**Level: Chameleon**  
**Pure Maths (Digits)**

A magician shows you four cards:

Card A contains the numbers 1, 3, 5, 7, 9, 11, 13, 15

Card B contains the numbers 2, 3, 6, 7, 10, 11, 14, 15

Card C contains the numbers 4, 5, 6, 7, 12, 13, 14, 15

Card D contains the numbers 8, 9, 10, 11, 12, 13, 14, 15

The magician asks Andy to choose a positive integer from 1 to 15, which the magician will try to guess. The magician asks Andy to tell him which card(s) do NOT contain Andy's number. If Andy responds with "B and C", then what is Andy's number?

- A. 9
- B. 10
- C. 11
- D. 12

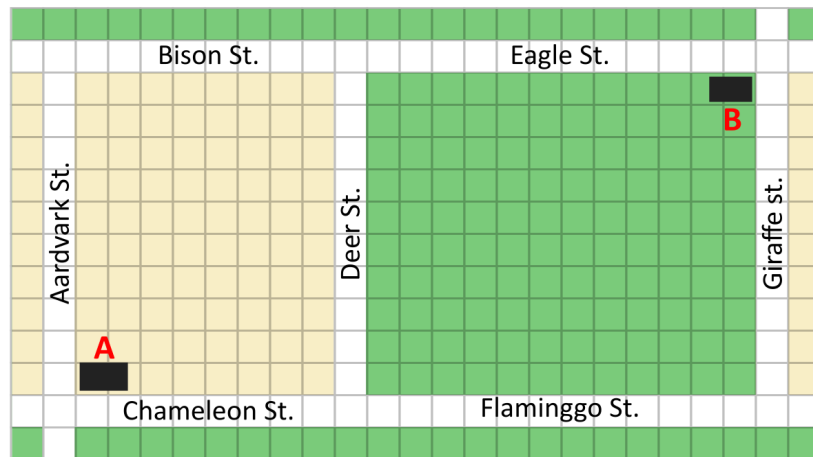


# KOMODO Maths Festival

## Sample Questions

**Level: Chameleon**  
**Applied Maths (Word Problems)**

Tony wants to go from Townhall (building A) to the New Cinema (building B). He has several options as shown in the map below. He can go through Aardvark Street then Bison street and Eagle Street, or any other path that he can take from A to B.



Because the traffic condition on each street is different, the average speed that a car can go through each street are as follows, in both directions.

Street	Average speed (km/h)
Aardvark	40
Bison	35
Chameleon	45
Deer	40
Eagle	60
Flaminggo	35
Giraffe	50

Which route is the fastest route that Tony can take if he's driving from the townhall to the New Cinema?

- Aardvark St. - Bison St. - Eagle St.
- Chameleon St. - Deer St. - Eagle St.
- Chameleon St. - Flaminggo St. - Giraffe St.
- Aardvark St. - Bison St. - Deer St. - Flamingo St. - Giraffe St.



# KOMODO Maths Festival

## Sample Questions

**Level: Iguana**

**Pure Maths (Inequalities)**

If  $x$  and  $y$  are real numbers such that  $x > 1 > y > 0$ , then which of the following is guaranteed?

A)  $\frac{1}{x} > \frac{1}{y}$

B)  $x > \frac{1}{y}$

C)  $x - 1 > y + 1$

D)  $\frac{1}{x-y} > \frac{y}{x}$



# KOMODO Maths Festival

## Sample Questions

Level: Iguana

Applied Maths (Probabilities)

Here is the classement of Italian Serie A league one match before the season ends.

Club	MP	W	D	L	GF	GA	GD	Pts
1 Juventus	37	25	7	5	89	35	54	82
2 Inter	37	25	6	6	74	41	33	81
3 Atlanta	37	23	10	4	90	47	43	79

The last column shows points collected by each club during the season. Having collected 82 points Juventus is leading, but the points can still change. For one match, the team will gain 3 points if it wins, 1 point if it draws, and no points if it loses.

According to experts, here is the probability of the results gained by the three top teams in their last match.

Club	win	draw	lose
Juventus	20%	30%	50%
Inter	30%	40%	30%
Atlanta	60%	20%	20%

What is the probability that the three top teams will get the same points at the end of the season?

- A. 20%
- B. 4.8%
- C. 1.2%
- D. 0.03%



# KOMODO Maths Festival

## Sample Questions

**Level: Dragon**

**Pure Maths (Trigonometry)**

If  $\sin \sin A + \sin \sin B = \sin \sin (A + B)$  and  $0^\circ \leq A \leq B \leq 180^\circ$ , then how many possible values of  $\cos \cos A$  are there?

- A. No possible value
- B. Only one possible value
- C. Two possible values
- D. Infinitely many possible values



# KOMODO Maths Festival

## Sample Questions

**Level: Dragon**  
**Applied Maths (Geometry)**

Do you know that if you're near a very tall building, you can see the sunset twice? First, stay on the ground and observe the first sun set. And then after that you can go up the top of the tall building and if you're fast enough you will still be able to see the sun, and after some waiting you can enjoy your second sunset.

But do you also know that we can calculate the time between the sunset from the height of a building? Using a little bit of geometry and some facts about the earth we can know about the height of the building.

The diagram below shows earth as seen from the north and the sun is moving counterclockwise as seen from the earth. A person from the base of the building will see a sunset when the sun is at A because it can only see through line 1. However the person is at the top of a building he can see through line 2 so that the sun only sets until it reaches position B.

The angle theta shows how far the earth rotates so that the sun will move from position A to position B. This also shows how long the time period is between these two. To rotate one full rotation the earth needs 24 hour. So to rotate  $\theta$  degree the earth need  $\theta/360 \times 24$  hour.

What is the rough time between two sunsets if the height of the building is 548 m and the radius of the earth is assumed to be 6400 km? You may use the cosine table below.

- A. 2 minutes
- B. 3 minutes
- C. 4 minutes
- D. 5 minutes

angle (degree)	cosine
0.5	0.99996192
0.75	0.99991433
1	0.99984770
1.25	0.99976203

