

Instructions

Carefully read the following excerpt from a promotional brochure for a BODMAS International School (school motto: “Everything in the right order”), and answer the questions at the end. Show all relevant working in your responses.

Welcome to BODMAS International School

Dear Parents and Guardians,

Thank you for picking up the new 2016 brochure and your interest in our school. Feel free to visit us, in person or online. In the meantime, here are some key facts and figures that should whet your appetite!



BODMAS International School educates boys and girls aged 11 to 18. We opened in 1982 with just 56 students, and have now grown to accommodate a roll of 950 pupils, with 38 nationalities represented. Currently 450 students are enrolled in the boarding section of the school, though we can accommodate 510 in our purpose-built boarding houses.

We are ideally located - just 48km from London Heathrow Airport with a shuttle-bus available that makes the journey in just 40-50 minutes.

Our extensive campus grounds cover 12.8 hectares, giving us enough space for 3 full-size soccer pitches, an astroturf hockey pitch and a general-purpose recreational area. Our Sports Hall boasts a 6-lane 25m swimming pool, basketball and netball courts and a fitness area.

Our teaching blocks are purpose-built and feature 6 science labs, two ICT suites and an auditorium that seats 460.

The school day starts at 0800 with a short registration/tutorial period, followed by seven 55-minute periods, interspersed with various breaks for snacks and lunch.

Lessons end at 1610, and there are a number of activities and clubs available after that time. On any given day at least 70% of our students will be involved in activities after period 7.

We have 68 full-time teachers and 12 part-time teachers, along with 50 support staff. 25% of our teachers have higher degrees.

Basic school tuition fees (in £) for non-boarding students are as in the table below:

	Term 1	Term 2	Term 3
Years 7 - 9	6 000	6 000	5 500
Years 10 & 11	7 000	7 000	6 500
Years 12 & 13	9 000	9 000	4 000

Year 7 to Y11 students who board pay a supplement of £1500 per term Y12 and Y13 students pay a supplement of £1800 per term.

Sibling Discount: The third (and subsequent) member of a family enjoys a 40% discount on tuition fees.

Questions

- Q1. What percentage of the students at BODMAS International School are currently boarding students?
- Q2. You are told that 64 of the students hold passports from African countries, and that they are all boarding students. What percentage of boarding students *don't* come from an African country?
- Q3. What is the maximum average speed of the shuttle bus to London Heathrow? What is the maximum and minimum average speed?
- Q4. If the school's soccer pitches are all 98m long and 47m wide, what percentage of the campus area do they take up?
- Q5. The hockey pitch is 91.4m long and 55m wide. Because it is sometimes used for national competitions, it must also have a 3m strip all the way around the pitch (called a run-off strip) for safety purposes. What is the total area taken up by the hockey pitch, in m^2 to 2sig figs?
- Q6. The ratio of male to females among the teaching staff is 5:3. How many women teach at the school?
- Q7. 9 female teachers have higher degrees. Show that this represents a greater proportion than for male teachers.
- Q8. How much time in the school day (0800 to 1610) is set aside for breaks?
- Q9. The auditorium is used for a special concert. All the teachers are in attendance, as well as half of the support staff. What is the maximum number of students that can attend the concert?
- Q10. The Potter family sends their two children to the school. Harry is in Year 11 and boards at the school, while Beatrix is in Y8 and doesn't board. What yearly school fees do the Potters have to pay?
- Q11. Herr Winkler, from Germany, is about to take up a new job in the UK. He wishes to bring his three children with him. They are triplets and would be the right age to join Year 10. They wouldn't board at the school. Herr Winkler is somewhat unfamiliar with UK pounds, and wants to know what the yearly school fees would be in euros. The exchange rate is currently $\text{£}1 = \text{€}1.18$ How many euros would Herr Winkler have to pay if he has his three children educated at BODMAS International School?
- Q12. If each lane in the swimming pool is 2.5m wide, and there is a uniform depth of 1.8m throughout the pool, what volume of water does the swimming pool hold?

Solutions

- Q1. Currently 450 out of 950 students board \Rightarrow percentage is $\frac{450}{950} \times 100\% = 47.4\%$ (3sf)
- Q2. 64 boarders come from an African country \Rightarrow 450 - 64 or 386 boarders *don't* come from an African country. This is $\frac{386}{450} \times 100\% = 85.8\%$ (3sf)
- Q3. Maximum speed occurs for a 40-minute journey. This speed = $\frac{48km}{40/60h} = 72 \text{ km/h}$
- Minimum speed occurs for the 50 minute journey. This speed = $\frac{48km}{50/60h} = 57.6 \text{ km/h}$
- Q4. The area of the three pitches is $3 \times 98m \times 47m = 13\,818m^2 = 1.3818 \text{ ha}$
This represents $\frac{1.3818}{12.8} \times 100\% = 10.8\%$ (3sf)
- Q5. The dimensions of the hockey pitch are now 97.4m by 61m, giving an area of **5 900 m²** (2sf)
- Q6. $\frac{3}{8}$ of the teaching staff is female. There are 80 teachers, giving us 30 female teachers.
- Q7. 25% of teachers have a higher degree. This means 20 have higher degrees. This, in turn, means 11 male and 9 female teachers have higher degrees.
The percentage of women with higher degrees is $\frac{9}{30} \times 100\% = 30\%$
The percentage of men with higher degrees is $\frac{11}{50} \times 100\% = 22\%$
Thus, proportionally speaking, more female teachers have higher degrees.
- Q8. From 0800 to 1610 is 8 hours and 10 minutes. The seven lessons take up $7 \times 55\text{mins} = 385\text{mins}$. This is 6h 25m. Thus 1 hour 45 mins of the school day is taken with breaks etc.
- Q9. The auditorium will have 80 teachers and 25 support staff in - i.e. a total of 105 people. This means $460 - 105$ or **355** students can attend the concert.
- Q10. Harry's annual fees are $\pounds 7\,000 + \pounds 7\,000 + \pounds 6\,500$ plus $3 \times \pounds 1\,500$ for boarding. This is $\pounds 25\,000$. The annual fees for Beatrix are $\pounds 6\,000 + \pounds 6\,000 + \pounds 5\,500$. This is $\pounds 17\,500$. Thus the total fees for the family are **£42 500**
- Q11. The school fees for two of the three students would be
 $2 \times \pounds(7000 + 7000 + 6500) = \pounds 41\,000$
The 3rd child gets a 40% discount so only pays $0.6 \times \pounds(7000 + 7000 + 6500) = \pounds 12\,300$
Thus Herr Winkler pays $\pounds 53\,300$ or $1.18 \times \pounds 53\,300$ which is **€62 894**
- Q12. The pool must be $6 \times 2.5m$ wide or $15m$. Thus the dimensions of the pool are $1.8m$ deep, $25m$ long and $15m$ wide. This gives a volume of $1.8m \times 25m \times 15m$ or **675m³**