**Time: 90 min.**

# WORLD MATHEMATICAL OLYMPIAD

## Sample test

Candidate full name:.....

School:..... Class:.....

Date:.....

- The test is 90 minutes long
- You may NOT use a calculator
- You will need: pen, pencil, rubber and ruler
- Try to answer all the questions.
- Write all your answers and working on the test paper – do not use any rough paper.
- Check your work carefully.
- Raise your hand if you have a question.
- Cheating will result in failure.

| Multiple choice questions | Marks |
|---|---|
| 1 | /8 |
| 2 | /8 |
| 3 | /6 |
| 4 | /8 |
| Total | /30 |

| Fill in the blanks questions | Marks |
|---|---|
| 1 | /6 |
| 2 | /6 |
| 3 | /6 |
| 4 | /6 |
| 5 | /6 |
| Total | /30 |

| Short answer questions | Marks |
|---|---|
| 1 | /10 |
| 2 | /10 |
| Total | /20 |

| Total score | /80 |
|---|---|

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Multiple Choice Questions

1. There are five British Money notes, £5, £10, £20, £50 and £100. The height of each note is the same at 65 mm, but the length of each note increases by 7 mm as the denomination increases. For example, the height of the £10 and £5 notes are the same, but the length of the £10 note is 7 mm longer than the £5 note. What is the difference between the areas of the £100 note and the £10 note?

(A) 455 mm² (B) 910 mm²

(C) 1365 mm² (D) 1820 mm² (E) 2275 mm²

8 marks

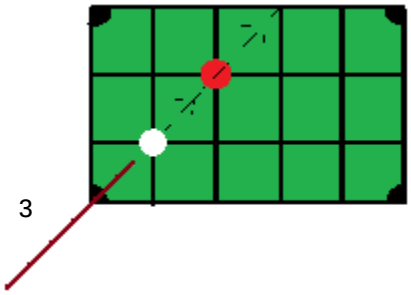
2. A shopping website automatically sends out promotional emails to its customers in 500 hour intervals. If James received a promotional email from the website last Tuesday at, 9 am, when will he receive his next email?


(A) Monday (B) Tuesday (C) Wednesday

(D) Thursday (E) Friday

8 marks

3. The following image is the layout of a pool table. The black segments of the pool table placed in each corner are pockets. If a pool ball is hit in the direction shown on the pool table, identify the pocket the ball will fall into. (Note: the ball will stay on a constant path until it falls into a pocket and the ball will not veer off its path. In addition, when the pool ball comes in contact with the edge of the billiards table, the ball will reflect off the edge at the same angle as it hit the edge.)




(A) Pocket 1 (C) Pocket 3

(B) Pocket 2 (D) Pocket 4

6 marks

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4. A department store held a discount event. For every £8 spent, customers received a red card. If customers collect 8 red cards they can swap them for 1 blue card. If customers collect 8 blue cards they can swap them for 1 Green card. If customers collect 8 green cards they receive 1 orange card. Customers who collect all four types of card will receive 1 discount card.

   What is the minimum amount of money needed to be spent to receive 1 discount card?

   (A) £4096 (D) 4680

   (B) 4608 (E) 4688

   (C) 4672


_____
8 marks

Fill in the blanks 6 points. for each problem

1. Shaun mistakenly purchased 5 loaves of bread and 2 bottles of milk, so he returned the merchandise and received a full refund. He then purchased 2 loaves of bread and 5 bottles of milk and the total came out to be £4.20 less than the refunded amount. Therefore, the price of 1 loaf of bread is £_____ (write "less than" or "more than" after the number) the price of 1 bottle of milk.


_____
6 marks

2. There are two ways Steph can travel back and forth between her home and school. She can walk to school and then take the school bus home, or she can take the bus to school and then walk home from school. These two ways both take 40 minutes each in total. If the time it takes to go to school and back home taking the bus both directions is 20 minutes, it takes _____ minutes to walk both directions.

_____
6 marks

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3. This is the mixing chart for the Smoothie factory to make their fruit smoothie drinks.

   a) How much beetroot juice is needed to make 100 litres of 'Beetarama'? _____
   b) How much kiwi juice is needed to make 620 litres of 'Mean green'? _____
   c) How much strawberry juice must be added to 60 litres of orange juice to make 'Sunshine sprite'? _____

_____
6 marks

4. The following menu is displayed in front of a restaurant. If 4 adults and 3 children under the age of 12 eat together, the minimum amount they have to pay is £_____.

| | |
|---|---|
| Adult | £30 |
| Children(Under 12) | £25 |
| Family Set A (1 adult, 1 child) | £45 |
| Family Set B (2 adults, 1 child) | £70 |

_____
6 marks

5. Two hikers walk at a speed of 4 km/h on level ground with a distance of 12 km between them. They come upon a hill and the two hikers both climb the hill at a speed of 3 km/h. When both hikers are on the uphill road, the distance between the two hikers is _____ km.

_____
6 marks

**Time: 90 min.**

Short Answer Questions 10 points for each problem

1. Students in the same class participate in the swimming and/or the biking competition events. Half the students participate in both events, and the number of students participating in the swimming event equals the number of students participating in the biking event. If the number of students participating in the swimming event is 24, what is the total number of students in the class?

_____ Students

6 marks

2. In each of the cells of the 6 x 6 chart below, one of the numerals 2, 0, 1, and 5 can be inserted. In each row and column, one-digit numbers, two-digit numbers, three-digit numbers, and four-digit numbers may be inserted with blank cells separating numbers. The numbers to the right and bottom of the chart represent the sum of the numbers in the respective row or column and numbers that are two or more digits may not start with the numeral 0. The picture on the right is a sample of a chart completed following the conditions. Complete the chart on the left.

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | 2015 |
| | | | | | | 503 |
| | | | | | | 206 |
| | | | | | | 521 |
| | | | | | | 521 |
| | | | | | | 71 |
| 125 | 53 | 152 | 35 | 53 | 35 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 0 | | | 1230 |
| | 1 | 2 | | 3 | 0 | 42 |
| 3 | | 1 | 2 | 0 | | 123 |
| | 3 | 0 | 1 | | 2 | 303 |
| 2 | 0 | | | 1 | 3 | 33 |
| 0 | | | 3 | 2 | 1 | 321 |
| 24 | 51 | 3210 | 24 | 42 | 231 | |

6 marks

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Answers:

[Multiple Choice Problems ]

1. (C) 1365
2. (B) Tuesday
3. (B) Pocket 2
4. (D) 4680

[Fill in the blanks]

1. The second time, Jason bought 3 more bottles of milk and 3 less loaves of bread. Since he paid $4.20 less the second time, we can deduce that 1 loaf of bread is more expensive than 1 bottle of milk by $4.2÷3=$1.40.

   Answer = $1.40 more than

2. The total amount of time it takes Steph to travel to school and back by walking and taking the bus is 80 minutes. But, the time it takes to go back and forth by bus only is 20 minutes. Therefore it takes 80-20=60 minutes to walk both ways to and from school.

   Answer = 60 minutes

3. a) 100 / 4 = 20
   20 x 3 = 60
   = 60 liters

   b) 620/10 = 62
   62 x 6 = 372
   = 372 liters

   c) 60 / 4 = 15
   15 x 2 = 30
   = 30 liters

4. In order for 4 adults and 3 children under the age of 12 to eat at the lowest price possible, they need to maximize the number of family sets ordered.

   (1) If they order 2 Family Set A and 1 Family Set B the total price is £45 × 2+£70 × 1=£160;

   (2) If they order 2 Family Set B and 1 Child meal the total price is £70x2+£25=£165; and

   (3) If they order 3 Family Set A and 1 Adult meal the total price is £45x3+£30=£165.

SAMPLE

Other combinations from the above all result in the price increasing, and so the minimum amount they have to pay is £160.

Answer = £160

5. The distance between hikers is 12 km. As such, when the first hiker starts climbing the hill, the second hiker is 12 km behind. The second hiker is still walking at a speed of 4 km/h and needs to walk for 12 ÷ 4=3 hours to reach the start of the hill. In the meantime, the first hiker is climbing the hill at 3 km/h, and so in that same 3 hours can only travel 3x3=9 km. Therefore, by the time the second hiker reaches the hill, the distance between the hikers has decreased to 9 km.
   Answer = 9 km

## [Short Answer Problems]

1. Half of the class participates in both events and since the number of students participating in swimming is the same as those participating in biking, the sum of these students equals 1/2 of the total number of students in the class. The number of students participating only in the swimming event is equal to 1/4 of the total number of students, and the number of students participating only in the biking event is also 1/4 of the total. As such, the number of students participating in the swimming event represents 3/4 of the total number of students in the class. 24 students participate in the swimming event. Therefore, the total number of students in the class is 24 ÷ 3/4= 32.

2.

| | | | | | | |
|---|---|---|---|---|---|---|
| | 2 | 0 | 1 | 5 | | 2015 |
| 1 | | | 5 | 0 | 2 | 503 |
| 2 | 0 | 1 | | | 5 | 206 |
| 0 | | 5 | 2 | 1 | | 521 |
| | 5 | 2 | 0 | | 1 | 521 |
| 5 | 1 | | | 2 | 0 | 71 |
| 125 | 53 | 152 | 35 | 53 | 35 | |