International SoM Contest 2026 Grade Seven Solutions

1) **D** The improper fraction $\frac{7}{4}$ is equivalent to the mixed fraction $1\frac{3}{4}$. The mixed fraction $1\frac{4}{8}$ in reduces to $1\frac{1}{2}$ which is not equal to $1\frac{3}{4}$.

2) **C** The largest difference occurs when –13 is subtracted from 23. The resulting difference is $23 - (-13) = 36$.

3) **A** Evaluate according to the order of operations:
$$\begin{aligned} 6 - [3 - (5 - 4)] &= 6 - [3 - 1] \\ &= 6 - 2 \\ &= 4 \end{aligned}$$

4) **D** Evaluate according to the order of operations:
$$\begin{aligned} 2^3 - 3^2 &= 8 - 9 \\ &= -1 \end{aligned}$$

5) **A** Solve for x in the inequality:
$$\begin{aligned} 3x + 7 &< 34 \\ 3x &< 27 \\ x &< 9 \end{aligned}$$
All possible values of x are less than 9. The only possible value of x from the options given is 8.

6) **B** Evaluate according to the order of operations:
$$\begin{aligned} \sqrt{28 - \sqrt{6 + \sqrt{9}}} &= \sqrt{28 - \sqrt{6 + 3}} \\ &= \sqrt{28 - \sqrt{9}} \\ &= \sqrt{28 - 3} \\ &= \sqrt{25} \\ &= 5 \end{aligned}$$

7) **C** In ascending order, the digits form the number 2578. In descending order the digits form the number 8752. The difference between the two numbers is $8752 - 2578 = 6174$.

8) **B** Solve for the positive value of x.
$$\begin{aligned} 3x^2 - 3 &= 240 \\ 3x^2 &= 243 \\ x^2 &= 81 \\ x &= 9 \end{aligned}$$

9) **D** A circle has an infinite number of axes of symmetry because any line drawn through the centre of the circle will divide the circle into two symmetrical parts.

10) **C** The prime factorization of 999 is $3^3 \times 37$. The largest prime factor of 999 is 37.

11) **C** To find 5% of the price of an item, the price is multiplied by 0.05. This is the same as dividing the price by 100 and then multiplying by 5. Option A is incorrect because finding one-fifth of the price of the item is the same as calculating 20% of the price. Options B is incorrect because multiplying the price by five-tenths is the same as calculating 50% of the price. Option D is incorrect because multiplying the price by 0.5% is the same as dividing the price by 100 and then multiplying by 0.5.

12) **C** The remaining slice is
$$1 - \frac{1}{3} - \frac{2}{7} - \frac{1}{5} = \frac{105 - 35 - 30 - 21}{105} = \frac{19}{105} \text{ of the pizza.}$$

13) **A** There are seven days in one week. There are $273 \div 7 = 39$ weeks in 273 days with no remainder. Therefore, in 273 days, it will be the same day of the week: Tuesday.

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14) **B** A triangular prism is a three-dimensional shape that has two identical triangular bases connected by three rectangular lateral faces. It has a total of six vertices, nine edges, and five faces.
Substitute into $x = 6$, $y = 9$, *and* $z = 5$ into $(x + y + z)^2$ and evaluate.
$(x + y + z)^2 = (6 + 9 + 5)^2$
$= 400$

15) **C** If *AO* is twice as large as *BP,* then the distance from *A* to C can be divided into six equal parts where each part is $24 \div 6 = 4$ cm in length. *BP* is 4 cm and represents the radius of the smaller semicircle. *AO* is $4 \times 2 = 8$ cm and represents the radius of the larger semicircle. The formula for the area of a circle is $A = \pi r^2$. The area of the larger semicircle is $0.5 \times \pi \times 8^2 = 32\pi$ cm^2 and the area of the smaller semicircle is $0.5 \times \pi \times 4^2 = 8\pi$ cm^2. The sum of the two areas is $32\pi + 8\pi = 40\pi$ cm^2.

16) **B** All numbers who digits sum to 11 between 300 and 400 must begin with the digit 3 in the hundreds column. The remaining two numbers can be 0 and 8, or 1 and 7, or 2 and 6, or 3 and 5, or 4 and 4. The resulting numbers are: 308, 380, 317, 371, 326, 362, 335, 353, and 344 respectively. There are nine numbers in total.

17) **C** Count the paths to each intersection going down and right. Each intersection is the sum of the two preceding intersections. There are 56 pathways from A to B.

A	1	1	1	1	1
1	2	3	4	5	6
1	3	6	10	15	21
1	4	10	20	35	56
					B

18) **D**

Step 1
$7 \oplus 3 = 7 \times 3 - 7 - 3$
$= 21 - 10$
$= 11$

Step 2
$11 \otimes 6 = 11^2 + 6^2 - 11 \times 6$
$= 121 + 36 - 66$
$= 91$

Step 3
$91 \oplus 2 = 91 \times 2 - 91 - 2$
$= 182 - 93$
$= 89$

The sum of the digits of 89 is $8 + 9 = 17$.

19) **A** Look for a pattern in the sum of the digits of the first few factorials. The sum of the digits of the factorial of 6, or the factorial of any integer larger than 6, is 9 or a multiple of 9. This is because there are at least two factors of 3 in 6! and in the factorial of any number larger than 6. The divisibility rule for 9 states that a number is divisible by 9 when the sum of its digits is divisible by 9. Therefore, when the sum of the digits of 13! is divided by 9, the remainder will be 0.

	Sum of the Digits
1! = 1	1
2! = 2	2
3! = 6	6
4! = 24	6
5! = 120	3
6! = 720	9
7! = 5040	9
8! = 40320	9
9! = 362880	9
10! = 3628800	27

20) **C** There are eight letters in the word TRIANGLE. No repetitions are allowed, so there are eight choices for the first letter, seven choices for the second letter, six choices for the third letter, and five choices for the fourth letter. The number of four-letter words that can be formed is $8 \times 7 \times 6 \times 5 = 1680$.

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21) **B** Work backwards from 560. Forty percent more than an unknown number is 560. To find 40% more than a number, the number must be multiplied by 1.4. Therefore, to find the original number when 40% of that number is 560, perform the opposite operation. The original number is $560 \div 1.4 = 400$. Two-thirds of an unknown number is 400. To find two-thirds of a number, the number must be multiplied by 2 and divided by 3. Therefore, to find the original number, perform the opposite operations with the same numbers. The original number is $400 \times 3 \div 2 = 600$.

22) **B** The prime factorization of 75600 is $2^4 \times 3^3 \times 5^2 \times 7$. Perfect fourth powers must have prime factors that have an exponent of any multiple of 4. The only prime factor in the prime factorization of 75600 that has an exponent of a multiple of 4 is 2. Therefore, 2^4 is the largest perfect fourth power that will divide into 75600.

23) **B** If the probability of randomly selecting a student that did not choose basketball is $\frac{5}{7}$, then the probability of selecting a student who chose basketball is $1 - \frac{5}{7} = \frac{2}{7}$. Twenty students chose basketball, so $\frac{2}{7}$ of the number of total number of students surveyed is 20. The total number of students surveyed was $20 \times 7 \div 2 = 70$. The number of students that chose soccer is $70 - 35 - 20 = 15$.

24) **D** The formula for the circumference of a circle is $C = 2\pi r$ and the formula for the area of a circle is $A = \pi r^2$, where r is equal to the radius. Set the two formulae equal to each other: $2\pi r = \pi r^2$. Divide both sides of the equation by π: $2r = r^2$. Therefore, twice the radius must be equal to the radius squared. The only value of r that would make the equation true is 2 because $2 \times 2 = 2^2$. The diameter of a circle is twice the length of the radius, therefore the diameter is $2 \times 2 = 4$.

25) **A** There are 10 choices for the first flavour, 9 remaining choices for the second flavour, and 8 remaining choices for the third flavour. Therefore, there are $10 \times 9 \times 8 = 720$ ways to choose three different flavours from 10 available flavours. However, we must divide by the number of ways the three flavours can be arranged, because the order of the flavours does not matter and each group of three flavours is counted $3! = 6$ times. Therefore, there are $720 \div 6 = 120$ ways Harkiran can choose three flavours.

26) **C** The difference between the second term and the first term is $1^3 = 1$. The difference between the third term and the second terms is $2^3 = 8$. The difference between the fourth term and the third term is $3^3 = 27$. Following the same pattern, the difference between the seventh term and the sixth term will be $6^3 = 216$. Therefore, the seventh term will be $226 + 216 = 442$.

27) **D** Notice that the perfect square ends in a 9. Therefore, its square root must have a units digit of 3. Also notice that the perfect square is in the 6000's. Knowing that $80 \times 80 = 6400$, it can be estimated that the square root of $6mn9$ is 83. Multiply 83 by 83 to confirm. The four-digit number $6mn9$ is $83^2 = 6889$. Therefore, $m = 8$ and $n = 8$, and $m + n = 16$.

28) **B** Find the LCM of 3, 5, and 7. Since they are all prime numbers, their LCM is $3 \times 5 \times 7 = 105$. If the first number the three sequences have in common is 1, the next number the three sequences will have in common is $1 + 105 = 106$.

29) **C** According to the Triangle Inequality Theorem, the sum of the lengths of any two sides of a triangle must be greater than the length of the third side. Therefore, the triangle cannot be a $7 - 7 - 15$ isosceles triangle because $7 + 7 < 15$. The triangle must be a $7 - 15 - 15$ isosceles triangle because the sum of the lengths of any of its two sides is greater than the third side: $7 + 15 > 15$ and $15 + 15 > 7$. The perimeter of the triangle is $7 + 15 + 15 = 37$ cm.

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30) **B** Average speed is found by dividing the total distance travelled by the total time taken to travel the total distance. The total distance Ken travelled is 2000 + 2000 + 2000 = 6000 km. The time it took for Ken to travel each segment is found by dividing the distance by the speed for that segment. It took Ken 2000 ÷ 40 = 50 hours to travel from Winnipeg to Toronto at 40 km/h. Then it took Ken 2000 ÷ 100 = 20 hours to travel from Toronto to Winnipeg at 100 km/h. Finally, it took Ken 2000 ÷ 200 = 10 hours to travel back to Toronto at 200 km/h. Ken's total time was 50 + 20 + 10 = 80 hours. Ken's average speed over his total trip was 6000 ÷ 80 = 75 km/h.

31) **B** There are 100 cm in a meter, so the soccer ball starts at a height of 4 × 100 = 400 cm. With every bounce, the height is multiplied by $\frac{4}{5}$. To find the height of the soccer ball after the fourth bounce, multiply the initial height by $\frac{4}{5}$ four times. Express the answer in powers of 2 and 5.

$$400 \times \frac{4}{5} \times \frac{4}{5} \times \frac{4}{5} \times \frac{4}{5} = \frac{2^4 \times 5^2 \times 2^2 \times 2^2 \times 2^2 \times 2^2}{5^4}$$
$$= \frac{2^{12} \times 5^2}{5^4}$$
$$= \frac{2^{12}}{5^2}$$

32) **B** The formula for the area of a triangle is half of the base × height. The repeating decimal $6.\overline{4}$ is equivalent to the fraction $6\frac{4}{9}$. Insert the values that are known into the area formula and solve for the height (h).

$$6\frac{4}{9} = \frac{1}{2} \times 5\frac{1}{3} \times h$$
$$h = \frac{58}{9} \div \frac{1}{2} \div \frac{16}{3}$$
$$= 2\frac{5}{12} \text{ m}$$

33) **C** The sum of the integers from 1 to 99 inclusive can be found using the formula n(n + 1) ÷ 2 where n is equal to the last integer. The sum of the integers from 1 to 99 is 99 (99 + 1) ÷ 2 and the sum of the integers from 1 to 50 is 50 (50 + 1) ÷ 2.

$$\frac{1+2+3+\cdots+98+99}{1+2+\cdots+49+50} = \frac{99\,(100) \div 2}{50\,(51) \div 2}$$
$$= \frac{66}{17}$$

34) **A** Set x to equal $1.1\overline{42}$. Since there are two repeating digits, multiply both sides of the equation by 10^2 and then subtract x from both sides of the equation. Solve for x as shown below.

$$100x = 14.2424242$$
$$100x - x = 114.2424242 - 1.142424242$$
$$99x = 113.1$$
$$x = 113.1 \div 99$$

Express x as the fraction $\frac{1131}{990}$ and reduce to $\frac{377}{330}$. The value of $a - b$ is $377 - 330 = 47$

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35) **B** There are 1000 – 760 = 240 men in the population. Of these men, 240 ÷ 3 = 80 are vegetarian. Therefore 240 – 80 = 160 men are not vegetarian. The percent probability of randomly selecting a man who is not a vegetarian is 160 ÷ 1000 × 100 = 16%.

36) **D** A probability of $\frac{2}{3}$ is equivalent to $\frac{4}{6}$. This means that out of the six possible outcomes when drawing a card from the box, four of those outcomes must have less than three vowels. Three of the first four words, CLASS, SUN, and LION, satisfy this condition. Therefore, only one more word out of the two remaining cards should satisfy the condition in order to yield the probability of $\frac{4}{6}$. The correct answer should consist of one word that satisfies the condition (WORK) and one word that does not satisfy the condition (GENIUS).

37) **B** There are 193 – 1 = 192 representatives at the conference. At noon, 192 ÷ 2 = 96 participants leave to get lunch. Shortly after, 96 ÷ 3 = 32 participants leave to get coffee, leaving 96 – 32 = 64 participants at the conference. The number of participants that left to either get lunch or coffee is 96 + 32 = 128. If $\frac{7}{8}$ of them returned, then $\frac{1}{8}$ did not return. The number of participants that did not return is 128 ÷ 8 = 16.

38) **B** From Monday morning at 6:00 am to Saturday morning at 6:00 am, there are 5 × 24 = 120 hours. The number of seven-hour shifts that take place within those 120 hours is 120 ÷ 7 = 17 with a remainder of one hour. This means that the earliest shift on Saturday morning starts one hour before 6:00 am. It starts at 5:00 am.

39) **C** Make a chart tracking the number of digits that are used for different intervals of page numbers. Up to and including page 209, a total of 9 + 180 + 300 + 30 = 519 digits have been used, leaving 525 – 519 = 6 digits remaining. Page numbers 210 and 211 use the remaining 6 digits for a total of 211 pages in the novel.

Page Numbers	Number of Digits
1 to 9	9 × 1 = 9
10 to 99	90 × 2 = 180
100 to 199	100 × 3 = 300
200 to 209	10 × 3 = 30
210, 211	2 × 3 = 6

40) **A** When Olly mixes 25 L of grapeseed oil into the vat containing 100 L of olive oil, there is a total of 100 + 25 = 125 L of oil in the vat where the ratio of olive oil to grapeseed oil is 4:1. When 50 L of oil is removed from the vat, there is 125 – 50 = 75 L of oil left in the vat and the ratio of olive oil to grapeseed oil remains the same at 4:1. This means that the vat now contains 60 L of olive oil and 15 L of grapeseed oil. When Olly adds another 25 L of grapeseed oil to the vat, the vat contains a total of 75 + 25 = 100 L of oil. The vat now contains 15 + 25 = 40 L of grapeseed oil and 100 – 40 = 60 L of olive oil. The ratio of olive oil to grapeseed oil in the vat is 60:40 which reduces to 3:2.

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