The solutions provided here are not always the only way to get to the correct answer, nor even the quickest.

A recipe for a tropical fruit drink is as follows: 500 mL water, 250 mL orange juice, 100 mL mango juice, and 150 mL apple juice.

(1) What fraction of the drink is made up of orange juice?

(A) 1/25 (B) 1/8 (C) 1/4 (D) 1/3

■ **(C)**: The total drink has $500 + 250 + 100 + 150 = 1000$ ml in it, so the fraction that is orange juice is $\frac{250}{1000} = \frac{1}{4}$.

(2) How much mango juice would there be in a 250 mL cup of the drink?

(A) 10 mL (B) 12 mL (C) 20 mL (D) 25 mL

■ **(D)**: As seen the total drink is 1000 ml. Since the mango juice is one tenth of that, we divide 250 by 10 to get 25 mL.

(3) Rawiri wants to make 3.5 L of the drink using this recipe. How much apple juice would he need?

(A) 450 mL (B) 500 mL (C) 525 mL (D) 625 mL

■ **(C)**: Since 3.5 L is 3.5×1 L we multiply 150 mL by 3.5 to get 525 mL.

(4) A weaker version of the drink can be made by including doubling the amount of water. What percentage of this weaker drink would be apple juice?

(A) 10% (B) 12.5% (C) 15% (D) 20%

■ **(A)**: The weaker drink has $1000 + 250 + 100 + 150 = 1500$ ml in it, so the fraction that is apple juice is $\frac{150}{1500} = \frac{1}{10}$, which in percentage terms is 10%.

An online stationery store sells pencils, pens, erasers and notebooks. The price of each item is stored in the following table:

Item	Sale Price
Pencil	10c
Pen	15c
Eraser	20c
Notebook	$1.50

(5) Deborah buys one of each item. How much does she spend?

(A) $1.25 (B) $1.60 (C) $1.95 (D) $2.10

■ **(C)**: $10 + 15 + 20 + 150 = \$1.95$.

(6) Liam spends $2.10 on some pens and pencils. He buys four times as many pens as he does pencils. How many pencils does Liam buy?

(A) 3 (B) 4 (C) 6 (D) 12

■ **(A)**: If Liam bought 3 pencils he would buy 12 pens, and $3 \times 10 + 12 \times 15 = \$2.10$.

(7) The store is considering increasing the price of notebooks by 10%. Assuming they sell 6 notebooks per day, how much more money would they make in May, June, and July if they made this change at the start of 2026?

(A) $82.80 (B) $96.00 (C) $124.20 (D) $240.50

■ **(A)**: There are $31 + 30 + 31 = 92$ days in May, June, and July. Without the increase in price, 6 notebooks sold per day during the period in question would make $92 \times 1.50 \times 6 = \$828.00$. With the 10% increase in price, 6 notebooks sold per day during the period in question would make $92 \times 1.50 \times 1.1 \times 6 = \$910.80$. The difference is $82.80.

A bake sale runs for two days selling cakes and biscuits. Over both days, $240 is made by selling 54 items. A cake sells for $6 and a biscuit sells for $3.

(8) How many cakes were sold in total?

(A) 12 (B) 15 (C) 26 (D) 36

■ **(C)**: If 26 cakes were sold, then 28 biscuits were sold, and $6 \times 26 + 3 \times 28 = \$240$.

One-third of the items sold on the first day were cakes, while 5/9 of the items sold on the second day were cakes.

(9) How many cakes were sold on the second day?

(A) 6 (B) 12 (C) 18 (D) 20

■ **(D)**: Suppose 20 cakes were sold on the second day. It follows take 6 cakes were sold on the first day, 12 biscuits were sold on the first day, and 16 biscuits were sold on the second day. This produces the correct result since $\frac{6}{18} = \frac{1}{3}$ and $\frac{20}{36} = \frac{5}{9}$.

(10) How many more biscuits were sold on the second day than the first?

(A) 2 (B) 4 (C) 6 (D) 8

■ **(B)**: From the above $16 - 12 = 4$.

A six-sided die is rolled seven times. The first six numbers rolled are 3, 1, 3, 3, 5, 4. The seventh number is unknown.

(11) What is the mode of all seven numbers rolled?

(A) 3 (B) 4 (C) 5 (D) Not enough information

■ **(A)**: 3 is rolled three times. Even if the seventh number is one of the other numbers previously rolled it would only reach two rolls at most.

(12) What is the median of all seven numbers rolled?

(A) 3 (B) 4 (C) 5 (D) Not enough information

■ **(A)**: Ignoring the seventh roll, in order the rolls are 1, 3, 3, 3, 4, 5. No matter where the seventh roll would be placed in the ordered list, the middle number will still be 3.

(13) What is the mean of all seven numbers rolled?

(A) 2.5 (B) 3 (C) 4 (D) Not enough information

■ **(D)**: Without the knowledge of what the seventh roll is, it is impossible to calculate the mean from the existing data.

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(14) What is the value of $\frac{1+2+3+4}{5+6+7+8}$ as a simplified fraction?

(A) $5/8$ (B) $2/13$ (C) $10/26$ (D) $5/13$

■ **(D)**: The numerator of the fraction is 10, while the denominator is 26. Simplified this gives us $5/13$. ((C) is not correct because it isn't a simplified fraction.)

(15) What is the value of $\frac{1}{5} + \frac{2}{6} + \frac{3}{7} + \frac{4}{8}$ as a simplified fraction?

(A) $307/210$ (B) $28/31$ (C) $333/280$ (D) $39/28$

■ **(A)**: First, note that $2/6 = 1/3$ and $4/8 = 1/2$. Change the denominators of the fractions to 210:

$$\frac{42}{210} + \frac{70}{210} + \frac{90}{210} + \frac{105}{210} = \frac{307}{210}$$

Since 307 (prime) and 210 share no common factors we cannot simplify this fraction any further.

Seventeen students taking a high school maths test have the following scores: 18, 18, 34, 37, 40, 48, 48, 48, 58, 59, 68, 68, 73, 73, 78, 82, 85

(16) Which of the following is the median of the students' test scores?

(A) 48 (B) 58 (C) 59 (D) 62

■ **(B)**: Since the scores are ordered smallest to largest, we find the value of the 9th number, which is 58.

(17) Which of the following is the mode of the students' test scores?

(A) 18 (B) 48 (C) 55 (D) 68

■ **(B)**: The most common number in the list is 48.

(18) What was the mean test score?

(A) 55 (B) 58 (C) 62 (D) 65

■ **(A)**: The sum of the test scores is 935, and $\frac{935}{17} = 55$.

(19) A student taking the test late increases the mean test score by 1 point. What score did this student get?

(A) 56 (B) 62 (C) 68 (D) 73

■ **(D)**: The new mean score would be 56. Multiply this by 18 (the new number of students) to get 1008. Since the old sum of the test scores was 935, the student scored the difference: $1008 - 935 = 73$.

In physics, the half life of a decaying substance is the time it takes to reduce to half its initial quantity. A certain radioactive substance, Zn-71, has a half-life of 2.4 minutes.

(20) How much of a 100 g initial sample of Zn-71 would be left after 7.2 minutes?

(A) 25 g (B) 12.5 g (C) 10 g (D) 6.25 g

■ **(B)**: 7.2 minutes is three half lives of Zn-71. This means we divide 100 by 2^3 to get 12.5 g.

(21) How long would it take for a 48 g sample of Zn-71 to decay to 3 g?

(A) 4.8 minutes (B) 7.2 minutes (C) 9.6 minutes (D) 12 minutes

■ **(C)**: After 2.4 minutes the sample would now weigh 24 g. After 4.8 minutes it would weigh 12 g, after 7.2 minutes 6 g, and after 9.6 minutes 3 g.

(22) An unknown quantity of the Zn-71 is placed in a box for 12 minutes. Afterwards, the remaining quantity of Zn-71 is found to weigh 5 g. How much Zn-71 was there when it was initially placed in the box?

(A) 100 g (B) 160 g (C) 320 g (D) 400 g

■ **(B)**: 12 minutes is five half lives of Zn-71. Multiply 5 by 2^5 to get 160 g.

Jenny is making a patchwork quilt out of blocks of fabric. She has a central piece that is 80 cm wide and 100 cm long. She wants to surround the central piece with a border of fabric squares which are each 20 cm wide.

(23) What is the area of the central piece in m^2?

(A) 0.08 m^2 (B) 0.8 m^2 (C) 8 m^2 (D) 8000 m^2

■ **(B)**: 80 cm is 0.8 m, and 100 cm is 1 m. So $0.8 \times 10 = 0.8\ m^2$.

(24) How many square blocks does Jenny need to make her border?

(A) 18 (B) 20 (C) 22 (D) 24

■ **(C)**: Jenny will require 4 square blocks along the top, 4 square blocks along the bottom, 5 square blocks along the left, 5 square blocks along the right, and 4 square blocks for the corners. In total she will need $4 + 4 + 5 + 5 + 4 = 22$ blocks.

Jenny wants to sew a piece of fabric to the back of the quilt that is exactly the same size as her design, including the border.

(25) What area will her piece of fabric need to be, in cm^2?

(A) 8400 cm^2 (B) 9600 cm^2 (C) 12000 cm^2 (D) 16800 cm^2

■ **(D)** The piece of fabric will be 40 cm longer and 40 cm wider. Hence the dimensions are 120 cm by 140 cm, so the area will be 16800 cm^2.

Jed is running on a treadmill. He starts by walking at 6 km/h. After 20 minutes, he increases his speed to 12 km/h and runs for another 40 minutes.

(26) What distance did Jed travel on the treadmill in total?

(A) 10 km (B) 12 km (C) 12.8 km (D) 14 km

■ **(A)**: If Jed walked for an hour, he would walk 6 kilometres. He walks for one third of that time, so walks a distance of 2 kilometres. Similarly, he runs $\frac{2}{3} \times 12 = 8$ km. In total Jed travels $2 + 8 = 10$ km on the treadmill.

(27) What was Jed's average speed in kilometres per hour (km/h)?

(A) 8 km/h (B) 9 km/h (C) 10 km/h (D) 11 km/h

■ **(C)**: Jed only uses the treadmill for 1 hour.

Daniel is also running on a treadmill. He runs at a constant speed of 8 km/h, then slows down to a speed of 4 km/h. He runs for a total of 36 minutes, and completes a total distance of 4 km.

(28) For how long did Daniel run at 8 km/h?

(A) 12 minutes (B) 18 minutes (C) 24 minutes (D) 30 minutes

■ **(C)**: If Daniel runs at 8 km/h for 24 minutes, he covers a distance of 3.2 km. He then must run at a speed of 4 km/h for 12 minutes, a distance of 0.8 km, for a sum distance of 4 km.

(29) Daniel wants to run 2026 kilometres in 2026. He goes to the gym four times a week, and runs the same number of kilometres each time. How many kilometres should he run each time he goes to the gym if he wants to achieve his goal? Round your answer to one decimal place.

(A) 6.2 km (B) 7.3 km (C) 8.4 km (D) 9.7 km

■ **(D)**: Daniel will go to the gym $52 \times 4 = 208$ times in 2026. If he runs the same number of kilometres each time, the average time he runs will be the same as the amount he runs each time. Thus (rounded to one decimal place) he runs $\frac{2026}{208} = 9.7$ km per gym visit.

Here are a few ways of determining if a number is composite:

- Any even number that is not 2 is composite.
- Any number ending in 5 that is not 5 is composite.
- If the digits of a number greater than 3 add to a multiple of 3, that number must also be a multiple of 3, and thus is composite.

(30) Which of the following numbers is a multiple of 3?

(A) 31 (B) 36 (C) 41 (D) 46

■ **(B)**: 31 and 41 are both prime numbers, and the digits in 46 sum to 10, which is not a multiple of 3. The digits in 36 sum to 9, a multiple of 3.

(31) Which of the following numbers is a multiple of 3?

(A) 3210 (B) 2468 (C) 1234 (D) 2345

■ **(A)**: The digits in 1234 sum to 10, which is not a multiple of 3. The digits in 2345 sum to 14, which is not a multiple of 3. 2468 is twice 1234, so cannot be a multiple of 3. This leaves 3210, whose digits add to 6, a multiple of 3.

(32) Which of the following numbers is a multiple of 6?

(A) 2173 (B) 4918 (C) 5034 (D) 6183

■ **(C)**: A multiple of 6 is an even multiple of 3. This immediately excludes 6183 and 2173, which are both odd. The digits of 4918 do not sum to a multiple of 3, but the digits of 5034 do, so it must be a multiple of 6.

(33) One of the following numbers is prime. Which one is it?

(A) 111 (B) 113 (C) 115 (D) 117

■ **(B)**: 115 is a multiple of 5. The digits of 111 and 117 both sum to multiples of 3 (3 and 9 respectively). This leaves 113 as the only possible option.

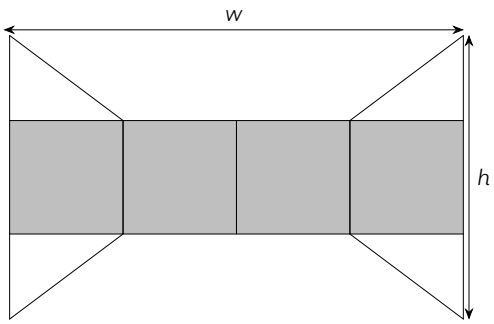

Figure 1

In Figure 1 a polygon has been constructed out of four squares and four right angled triangles. Each square has a side length of 3 cm, while the four triangles are congruent.

(34) What is the perimeter of the shaded region?

(A) 15 cm (B) 24 cm (C) 30 cm (D) 36 cm

■ **(C)**: $8 \times 3 + 2 \times 3 = 30$ cm.

(35) What is the area of the shaded region?

(A) 36 cm^2 (B) 42 cm^2 (C) 45 cm^2 (D) 51 cm^2

■ **(A)**: $(4 \times 3) \times (1 \times 3) = 36\,cm^2$.

(36) If the ratio of the width w of the polygon to its height h is 4:3, what is the area of the polygon?

(A) 48 cm^2 (B) 54 cm^2 (C) 64 cm^2 (D) 70 cm^2

■ **(B)**: The width of the polygon is 12 cm. The height is thus $(12/4) * 3 = 9$ cm.

Since each square has a side length of 3 cm, each triangle must have a height of $\frac{9-3}{2} = 3$ cm. Since the width of each triangle is also 3 cm, the area of the polygon is therefore:

$$36 + 4 \times (3 \times 3 \times \frac{1}{2}) = 36 + 18 = 54\,cm^2.$$

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(37) Three consecutive one digit integers are a perfect square, a perfect cube and a prime (not necessarily in that order). What is the product of these three integers?

(A) 60 (B) 210 (C) 336 (D) 504

■ **(D)**: The only perfect cubes with one digit are 1 and 8. Since neither 2 nor 3 are perfect squares, it follows that the perfect cube must be 8. This works, as 9 is a perfect square and 7 is prime. Take the product of the three: $7 \times 8 \times 9 = 504$.

(38) What is $\frac{2^8}{8^2}$ equal to?

(A) 2 (B) 4 (C) 16 (D) 64

■ **(B)**: Since $8 = 2^3$, we have $\frac{2^8}{(2^3)^2} = \frac{2^8}{2^6}$. Simplifying we get 2^2 or 4.

(39) What is half of 4^{2026}?

(A) 2^{2026} (B) 4^{1013} (C) 2^{4051} (D) 2^{1013}

■ **(C)**: Since $4 = 2^2$, we have $(2^2)^{2026}$, or 2^{4052}. Furthermore, halving a number is equivalent to multiplying it by 2^{-1}. So one half of 4^{2026} is $2^{4052} \times 2^{-1} = 2^{4051}$.

(40) What is the last digit of 3^{2026}?

(A) 1 (B) 3 (C) 7 (D) 9

■ **(D)**: First note that $3^4 = 81$, so squaring 3^4 must produce a number that also ends in 1: $3^4 \times 3^4 = 6561$. Since $3^4 \times 3^4 = 3^8$, it follows that for any n the last digit of 3^{4n} must be 1. The closest multiple of 4 smaller than 2026 is 2024. Thus the last digit 3^{2024} ends in 1. Since $3^{2026} = 3^{2024}3^2$, the last digit of 3^{2026} must be 9. (Using a computer it turns out that 3^{2026} has 967 digits!)