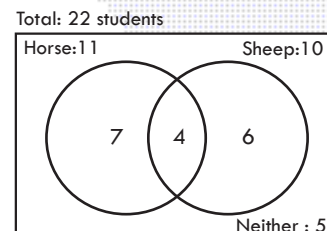


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- 1) **C** Follow the order of operations and calculate: $36 \div 6 - 8 + 10 = 6 - 8 + 10 = 8$
- 2) **C** In this sequence, the next term is found by dividing the previous term by three. Therefore, the next term will be $6 \div 3 = 2$.
- 3) **B** There are 56 portions of food distributed, four for each animal, so the shelter has enough portions for $56 \div 4 = 14$ animals.
- 4) **A** The nine-sided die has four even numbers (2, 4, 6, 8) and five odd numbers (1, 3, 5, 7, 9). Therefore, the probability of rolling an even number is $\frac{4}{9}$.
- 5) **A** The temperature starts at -6°C . By noon, it is $-6^\circ\text{C} + 8^\circ\text{C} = 2^\circ\text{C}$. By 6:00 p.m., it is $2^\circ\text{C} - 9^\circ\text{C} = -7^\circ\text{C}$. By midnight, it is $-7^\circ\text{C} - 3^\circ\text{C} = -10^\circ\text{C}$.
- 6) **C** "BUS" has three unique letters, so there are $3! = 6$ ways to arrange the letters in this word.
- 7) **C** If Emira is 13 years old in two years, Elora will be $13 - 7 = 6$ years old in two years. Therefore, Elora is $6 - 2 = 4$ years old this year.
- 8) **B** The whole numbers between $\sqrt{16} = 4$ and $\sqrt{144} = 12$ are: 5, 6, 7, 8, 9, 10, and 11. Among these, the numbers 6 and 9 are divisible by 3, so there are two numbers.
- 9) **D** Since the area of the large square is 36 units², the area of each small square is $36 \div 9 = 4$ units². Five small squares are shaded, so the total shaded area is $5 \times 4 = 20$ units².
- 10) **B** Your mom baked 18 raisin and 12 chocolate chip cookies. Therefore, the ratio of chocolate to raisin cookies is 12:18, which simplifies to 2:3.
- 11) **D** Use divisibility rules to check which number is not a divisor of 3960. The digit sum of 3960 is 18, which is divisible by 3. The last three digits form a number that is divisible by 8: $960 \div 8 = 120$. Also, the sums of the alternating digits of 3960 are: $3 + 6 = 9$ and $9 + 0 = 9$. Since $9 - 9 = 0$, and 0 is divisible by 11, the number 3960 is divisible by 11 as well. The only remaining option from the list is 13, so 13 is not a divisor.
- 12) **D** The distance between towns Lemzville and Old Rock is 600 km. Since the distance between Lemzville and New Mex is 15 times less than the distance between Lemzville and Old Rock, the distance between Lemzville and New Mex is $600 \div 15 = 40$ km. Therefore, the distance between the towns New Mex and Old Rock is $600 - 40 = 560$ km.
- 13) **B** Nam ran a total of $1 + 2 + 1 + 4 + 5 = 13$ hours from Monday to Friday. Daria ran a total of $2 + 1 + 1 + 3 + 4 = 11$ hours from Monday to Friday. Thus, Nam ran $13 - 11 = 2$ hours more than Daria.
- 14) **D** If all five numbers were the same, every number would be $75 \div 5 = 15$. However, the numbers are consecutive, so they must be split evenly on either side of 15 so that the sum remains the same. Therefore, the five numbers are 13, 14, 15, 16, and 17. Of the options given, only 13 is listed.
- 15) **B** It is known that $11 + 10 = 21$ students saw either a horse, a sheep, or both. However, only $22 - 5 = 17$ students saw an animal. Therefore, $21 - 17 = 4$ students are counted twice and saw both a horse and a sheep.



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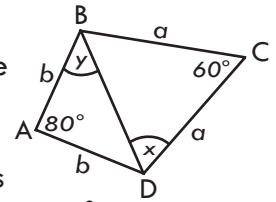
- 16) **A** A rice krispie is produced every 20 seconds and a truffle is produced every 24 seconds. The next time they will be produced together will be a multiple of 20 and 24. The least common multiple of 20 and 24 is
- $$20 = 2^2 \cdot 5$$
- $$24 = 2^3 \cdot 3$$
- $$\text{LCM} = \frac{2^3 \cdot 3 \cdot 5}{1}$$
- $$= 120$$
- This means the chocolates will be produced together again in 120 seconds, or two minutes after 9:15 a.m., which is 9:17 a.m.
- 17) **B** One week has 7 days. To have five fishing baits per day, $5 \times 7 = 35$ baits are needed. Since $35 \div 11 = 3$ – remainder 2, three packages of 11 are not enough. Four packages have $11 \times 4 = 44$ baits, which is more than 35 and enough for the fishing trip.
- 18) **D** A number divisible by two is an even number. The sum of two odd numbers or two even numbers is always even. Since $7 \div 2 = 3$ –remainder 1, there can be at most three pairs of odd numbers, or $3 \times 2 = 6$ odd numbers added together to produce an even number. The seventh number must be even and when added with the first six numbers, it produces an even number.
- 19) **B** Since there are only two repeating digits, the 2 will appear in every odd decimal place and the 7 will appear in every even decimal place. Since 23 is odd, the 23rd digit in the decimal expansion is 2.
- 20) **C** The sum of the scores of the ten students is $10 \times 85 = 850$. The sum of the scores of the remaining $25 - 10 = 15$ students is $15 \times 70 = 1050$. Therefore, the average score for the whole class is $(850 + 1050) \div 25$ or $1900 \div 25 = 76\%$.
- 21) **C** The prime factorization of 630 is: $2 \times 3 \times 3 \times 5 \times 7$. Thus, the prime factors of 630 are 2, 3, 5, and 7. The sum of these prime factors is $2 + 3 + 5 + 7 = 17$.
- 22) **D** Make an organized chart. Peta is born in April and Amina is not born in January. Therefore, Amina is born in September and Eric is born in January. Eric is 10 years old and Peta is not 12, so Peta is 11 years old and Amina is 12 years old. Therefore, Amina is 12 and she is born in September, Eric is 10 and he is born in January, and Peta is 11 and she is born in April.

	10	11	12	January	April	September
Amina	X	X	√	X	X	√
Eric	√	X	X	√	X	X
Peta	X	√	X	X	√	X



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- 23) **A** Since a kite has two pairs of equal sides, triangle BCD is an isosceles triangle with one angle of 60° . Therefore, the other two angles in the triangle are equal. The measure of each of the two remaining angles in this triangle is $(180 - 60) \div 2 = 120 \div 2$ or 60° . Thus, this triangle is an equilateral triangle or $x = 60^\circ$. Furthermore, triangle ABD is also an isosceles triangle. Therefore, the measure of angle y is $(180 - 80) \div 2 = 100 \div 2$ or $y = 50^\circ$. Thus, the difference between the angles x and y is $60^\circ - 50^\circ = 10^\circ$.



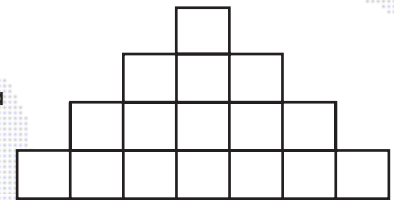
- 24) **C** If the numbers from 1 to 26 are replaced with letters in alphabetical order, use the following encryption table below to solve this question.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26

Since $20 = T$, $8 = H$, $5 = E$, $18 = R$, $23 = W$, $9 = I$, $12 = L$, $2 = B$, $19 = S$, $15 = O$, $3 = M$, and $18 = R$, Mr. Numeracy's message "20,8,5,18,5 23,9,12,12 2,5 1 20,5,19,20 20,15,13,15,18,18,15,23" would translate into "THERE WILL BE A TEST TOMORROW." Thus, when you get home, you should study for the test.

- 25) **A** Use order of operations: $(12 - 13)^2 - (-1 - 9)^2 \div (5 - -5) = (-1)^2 - (-10)^2 \div 10$
 $= 1 - 100 \div 10$
 $= 1 - 10$
 $= -9$

- 26) **B** Since the diagram indicates both the front and the side view, the monument is made of four layers of small cubes. The bottom layer has seven cubes visible from both the front and the side, or a total of $7 \times 7 = 49$ cubes. The second layer has five cubes visible from both the front and the side, or a total of $5 \times 5 = 25$ cubes.



The third layer has three cubes visible from both sides, or a total of $3 \times 3 = 9$ cubes. The top layer has only one cube. Therefore, total number of used cubes is $49 + 25 + 9 + 1 = 84$.

- 27) **C** If the length and width are each two times longer, then the area of the base has increased to be $2 \times 2 = 4$ times larger than the original base. Thus, the second container has a volume that is four times the first one. Therefore, it will take $4 \times 45 = 180$ seconds, or $180 \div 60 = 3$ minutes for Garima to fill the second container.

- 28) **C** Ali earns a total of $\$15 \times 24 = \360 per month. He spent $\frac{90}{360} = \frac{1}{4}$ of his monthly earning, which is $\frac{1}{4} \times 100 = 25\%$. Therefore, Ali spent 25% of his monthly salary on new headphones.

- 29) **C** The number of people from the 11th person to the 58th person is half the number of people around the full circle. There are $58 - 10 = 48$ people in half the circle, so there are $48 \times 2 = 96$ people in the full circle.

- 30) **A** Lucy has written the numbers 1, 2, 3, ..., 9 in her notebook. Lucy repeatedly multiplies two of the numbers, until there is only one number left. The order in which she multiplies the two numbers does not matter as the result will always be the product of $1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8 \times 9$. Since this expression has exactly one 5, and $2 \times 5 = 10$, the product can be written as $1 \times 3 \times 4 \times 6 \times 7 \times 8 \times 9 \times 10$. Therefore, this product ends in zero.

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- 31) **A** The prime factorization of 1680 is $2 \times 2 \times 2 \times 2 \times 3 \times 5 \times 7$. The numbers 5 and 7 cannot be multiplied with other numbers or they would no longer be single-digit numbers. The only way to have two other single digits is if they are $2 \times 2 \times 2 = 8$ and $2 \times 3 = 6$. Therefore, the sum of the digits is $5 + 6 + 7 + 8 = 26$.
- 32) **D** A) "Keep doubling the number obtained by the machine two hundred times." Incorrect, because the problem is asking to find the machine output after 100 numbers have been inserted.
 B) "Keep adding two to each number obtained by the machine hundred times." Incorrect, because adding two is not one of the machine's rules.
 C) "Keep doubling the inserted numbers until a two-digit number is obtained. Then, keep subtracting the digits of the numbers obtained by the machine until the 100th number is entered." Incorrect, because the difference between the digits of an inserted two-digit number is a one-digit number, so the machine rule should be switched back to doubling inserted numbers.
 D) "Keep finding the machine outputs following the rules until outputs start repeating." Correct, because there is a repeating cycle between the inputted and the outputted numbers.
- 33) **D** Start at A and move to the right to B, numbering all intersections by adding up the number of ways from the preceding intersections. There are 19 different ways from A to B, as shown in the diagram.
-
- 34) **B** Look for a pattern in the units digit of the first few powers of four: $4^1 = 4$, $4^2 = 16$, $4^3 = 64$, $4^4 = 256$. The units digits of the given numbers form a repeating block that contains the following digits in this order: 4, 6, 4, 6,... Since $155 \div 2 = 77$ —remainder 1, the cycle would repeat 77 times and would stop at the first digit in the block or 4. Thus, the digit 6 would appear 77 times.
- 35) **A** Work backwards. One minute before impact, both the comet and the rocket would have to travel for one minute. The comet travels at 3000 km/h, so it would travel $3000 \div 60 = 50$ km in one minute. The rocket travels at 1200 km/h, so it would travel $1200 \div 60 = 20$ km in one minute. Therefore, the comet and the rocket are $50 + 20 = 70$ km apart one minute before the impact. Since 30 seconds is one half of a minute, they are $70 \div 2 = 35$ km apart before impact.
- 36) **C** The height of the container is equal to the sum of the two diameters of the stored soccer balls. Thus, the diameter of one of the balls is $60 \div 2 = 30$ cm and the radius is $30 \div 2 = 15$ cm. The surface area of a sphere is $4\pi r^2$, so the surface area of one ball is $4 \times 15^2 \pi = 900\pi \text{ cm}^2$.
- 37) **C** Let a litres represent the initial amount of juice in container A and let b litres represent the initial amount of juice in container B. Since the amount of juice in container B doubled after pouring juice from container A, the amount of juice in container A would be $a - b$ and the amount of juice in container B would be $2b$. Then, since the amount of juice in container A doubled after pouring juice from container B, the amount of juice would be $2(a - b)$ in container A and $2b - (a - b)$ in container B. Since each of these amounts are equal to 16 L, then $2(a - b) = 16$ L or $a - b = 8$ L. Therefore, $2b - 8 = 16$, or $2b = 24$, or $b = 24 \div 2$, or $b = 12$ L. Since $a - 12 = 8$ L, the original amount of juice in container A was $a = 8 + 12$ or $a = 20$ L.

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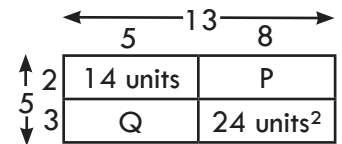
Alternate Solution:

Work Backwards. Make an organized chart as shown below.

	Container A	Container B
Amount of juice at the end	16 L	16 L
Amount of juice before pouring from container B to container A	$16 \div 2 = 8$ L	$16 + 8 = 24$ L
Amount of juice before pouring from container A to container B	$8 + 12 = 20$ L	$24 \div 2 = 12$ L

Therefore the original amount of juice in container A was 20 L.

- 38) **A** Since the area of the large rectangle is 65 units^2 and since the large rectangle cannot have dimensions 1×65 , it must have dimensions of 5×13 . The perimeter of a rectangle is $2L + 2W$, where L is the length and W is the width of the rectangle. So, from the top left



rectangle it is known that $2L + 2W = 14$, or $L + W = 14 \div 2$, or the sum of the dimensions is equal to 7. If the dimensions are 1×6 , then $13 - 6 = 7$ would be one of the side lengths of the bottom right rectangle. Since 24 is not divisible by 7, and also the other side of the larger rectangle is less than 6 this is not the case. So, they must be 2×5 or 3×4 . If the dimensions are 3×4 , then either $13 - 3 = 10$ or $13 - 4 = 9$ would be one of the side lengths of the bottom right rectangle. Since 24 is not divisible by either 9 or 10, this is not the case. Therefore, the top left rectangle has dimensions of 2×5 . Also, since $13 - 5 = 8$ and since $24 \div 8 = 3$, the lower right rectangles has dimensions of 3×8 . Therefore, rectangle P has dimensions of 2×8 or an area of $2 \times 8 = 16 \text{ units}^2$. Thus, rectangle Q has dimensions of 3×5 or an area of $3 \times 5 = 15 \text{ units}^2$. The difference of the areas of rectangles P and Q is $16 - 15 = 1 \text{ unit}^2$.

- 39) **B** The minute hand of a clock rotates 360° in an hour which is a full circle. Thus, the minute hand of a clock travels $360^\circ \div 60 = 6^\circ$ per minute. Since two hours and 25 minutes is $2 \times 60 + 25 = 145$ minutes, the minute hand traveled $145 \times 6^\circ = 870^\circ$. The hour hand of a clock travels $360^\circ \div 12 = 30^\circ$ in an hour or $30^\circ \div 60 = 0.5^\circ$ per minute. In 145 minutes, the hour hand traveled $145 \times 0.5^\circ = 72.5^\circ$. Therefore, the minute hand traveled $870 - 72.5 = 797.5^\circ$ more than the hour hand.
- 40) **B** The numbers in the middle square are equal to the sums of squares of the outer numbers in their respective quadrants. For example, in the top left square, $3^2 + 5^2 + 4^2 = 50$. As $x^2 + 2^2 + 8^2 = 237$, then $x^2 + 4 + 64 = 237$, or $x^2 = 237 - 68$, or $x^2 = 169$. Therefore, the missing number is $\sqrt{169} = 13$

