



MATHEMATICAL REASONING

Question Number	Answer	Solution
1	A	A is correct. This is because we have 3 squares each 4 cm^2 in area. Since the overlaps are $\frac{1}{4}$ of the square before it, that means the area overlapped is 1 cm^2. Since there are 2 overlaps, the total overlapped area is 2 cm^2. The total area of the shape is $3 \times 4 \text{ cm}^2 = 12 \text{ cm}^2$. Removing the overlapped area, that means the area of the combined shape is 10 cm^2. B is wrong as you have not removed the overlaps. C is wrong as you have removed 3 overlaps instead of 2. D is wrong due to calculation error. E is wrong due to calculation error. Tip: Calculate the areas of the overlaps and how many overlaps there are first.
2	A	A is correct. This is because the pattern is that the numbers, in each group, are +2 of the previous. i.e. $38 + 2 = 40$, $40 + 2 = 42$. This means we can work backwards from 64 by subtracting 2. This means the two numbers are 60 and 62. B is wrong as $63 + 2 = 65$, not 64. C is wrong as the pattern is adding 3. D is wrong as the pattern is adding 3. E is wrong as $55 + 2 = 57$, not 64. Tip: Addition patterns are very common; try them first!
3	B	A is not the answer as it is when you take into account of the 1st of March (if you assume it was a leap year but it isn't). B is the answer as you first need to know that it is not a leap year so February will only go up to 28th. Since there are 14 days from 14th of February to the 28th, this means the 28th of February will be the same day as the 14th. This means the 28th is Tuesday. After this, you just need to count the days carefully in which the 2nd of March will be the first Thursday in March. C is not the answer as this is the second Thursday rather than the first. D is not the answer as this is assuming you assume February has 29 days rather than 28 and you thought it was asking for the second Thursday and this affects your calculations. E is the not the answer due to calculation error. Tip: Make sure you know if it is a leap year or not when it comes to February. Then write out the days from Monday – Sunday to visualise the dates to make it easier to keep track.
4	D	A is wrong due to calculation error. B is wrong due to calculation error.

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		C	is wrong as you have misinterpreted the question as how many chairs could be fit in total in a 25 m ² room.
		D	is correct as the question is asking how many chairs can fit across the room. We know each chair is a 1 m² square, so this means each chair is also 1 m in width. Since the room is 5 m across, this means we can fit 5 chairs across the room.
		E	is incorrect as you cannot fit 10 chairs across a 5 m x 5 m room
		Tip:	Try rearrange the chairs so that you can fit as many chairs across the room as you can.
5	E	A	is not the answer as $1 \times 3 = 3$ marbles, which is too little.
		B	is not the answer as $3 \times 3 = 9$ marbles, which is too little.
		C	is not the answer as $2 \times 3 = 6$ marbles, which is too little.
		D	is not the answer as $5 \times 3 = 15$ marbles, which is too much.
		E	is the answer. Since we know James started off with 0 marbles and he has 12 marbles, this means he must have won $12/3 = 4$ games.
		Tip:	Test each answer by multiplying the number of games with 3 marbles.
6	A	A	is correct. Since the bridge is 100 m long, this means we can divide the bridge into five 20 m segments. Since each 20 m requires 10 support beams, the bridge requires a total of 5×10 support beams.
		B	is wrong. This is because this is twice the required number.
		C	is wrong as this is half the required number.
		D	is wrong due to calculation error.
		E	is wrong due to calculation error.
		Tip:	Remember to read the question to pick up that every 20 m of bridge requires 10 support beams.
7	D	A	is wrong as this statement is true.
		B	is wrong as this statement is true.
		C	is wrong as this statement is true.
		D	is the correct answer. Equilateral triangles have all angles equal to 60 degrees, so one angle being 90 degrees is impossible. This is a property of a right angled triangle.
		E	is wrong as this statement is true.
		Tip:	You can logically deduce that D is the false statement since if B and C are true, then D cannot be true.
8	C	A	is incorrect. Car C uses the least amount of fuel.
		B	is incorrect. Car C uses the least amount of fuel.
		C	is correct. Convert all the fuel consumption rates to the same units. This means Car A consumes 1.01 L of fuel per km, Car B consumes 1.2 L per km, Car C consumes 2 L per 2 km which is the same as 1 L per 1 km, Car D consumes 1.5 L per km and Car E consumes 1.1 L per km. Thus, it is clear that Car C consumes the least amount of fuel per kilometre.
		D	is incorrect. Car C uses the least amount of fuel.
		E	is incorrect. Car C uses the least amount of fuel.

Tip: Convert all the rates to the same units. Remember that 1000 mL = 1 L.

9

A

- A is correct. The question says that a code cannot have repeated numbers. This means that the only available numbers for the last digit is 0, 1, 2, 4, 6, 7, 9. This means 7 numbers are available.**
- B is wrong as you have forgotten one digit. This is most likely 0.
- C is wrong as this is if you include the 3, 5 and 8 into your answer.
- D is wrong as you have repeated numbers
- E is wrong as you have repeated numbers

Tip: Remember that 0 is also a possible number!

10

A

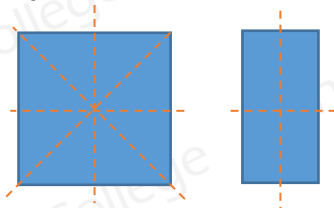
- A is correct. Since Emma has 88 chocolate pieces, this means she needs to divide 88 by 4 (herself + 3 friends) to get the correct number of chocolate pieces per person. $88/4 = 22$.**
- B is incorrect as this is the number of pieces each person would receive if you forgot to include Emma herself in your calculations.
- C is not the correct answer due to calculation error. $20 \times 4 = 80$. You still have 8 chocolate pieces left over.
- D is wrong as $21 \times 4 = 84$, which means you still have 4 chocolate pieces left over.
- E is wrong as $23 \times 4 = 92$. This 4 more than the number of chocolate pieces you actually have.

Tip: Make sure you understand the question and that it's the amount of chocolate that Emma needs to share amongst both her friends and herself.

11

C

- A is not the correct answer as this statement is true.
- B is not the correct answer as this statement is true.
- C is correct. Just because one of rectangle A's sides is longer than rectangle B's, does not mean it has more lines of symmetry than rectangle B. This could only be true if rectangle A was a square.**



- D is wrong as this is a correct statement.
- E is wrong as this is a correct statement

Tip: Draw out the shapes on paper by making rectangle A longer than rectangle B but keep their widths the same. You will see that C is clearly the incorrect statement and thus the correct answer.

12

C

- A is not the correct answer as point A has an x coordinate of 1 and a y coordinate of -4
- B is incorrect as point B has a x coordinate of 2 and a y coordinate of -4

- C** is the correct answer as the question needs you to find the point on the graph with an x coordinate of 1 and a y coordinate of 4. **Point C is the only point which has these coordinates.**
- D** is wrong as point D has an x coordinate of -4 and a y coordinate of 1.
- E** is wrong as point E has an x coordinate of -4 and a y coordinate of -1.

Tip: Remember that the x axis are horizontal while the y axis is vertical.

13

A

- A** is correct. We know that the total amount of food weighed 500 g. Since we know that all of the cookies weighed 300 g in total, we can just subtract this to find the weight of the biscuits. $500 \text{ g} - 300 \text{ g} = 200 \text{ g}$. So John had 200 g of biscuits. Since we know each biscuit weighs 50 g, we can divide the weights to find out how many biscuits he had. $200 \text{ g} / 50 \text{ g} = 4$, which is the answer.
- B** is incorrect as $5 \times 50 \text{ g} + 300 \text{ g} = 550 \text{ g}$, which is more than the total weight.
- C** is incorrect as $6 \times 50 \text{ g} + 300 \text{ g} = 600 \text{ g}$, which is more than the total weight.
- D** is incorrect as $3 \times 50 \text{ g} + 300 \text{ g} = 450 \text{ g}$, which is less than the total weight.
- E** is incorrect as $2 \times 50 \text{ g} + 300 \text{ g} = 400 \text{ g}$, which is less than the total weight.

Tip: Keep in mind the total weight of all the food: you cannot exceed this value.

14

E

- A** is wrong as this is half the weight of the chocolate Jacob got.
- B** is wrong as this is the weight of the whole bar.
- C** is wrong as this is the amount of chocolate Jacob got.
- D** is wrong as this is half the correct answer.
- E** is correct. This is because Daniel and Jacob split it in a 2:3 ratio. This means that for every 2 parts Daniel got, Jacob got 3 parts. We can convert this in terms of weight. This means for every 200 grams, Jacob got 300 grams of chocolate. $200 \text{ g} + 300 \text{ g} = 500 \text{ g}$, which means that Daniel received 200 g of chocolate.

Tip: Sometimes the ratio is really simple like in this question. You can see that $2 + 3 = 5$ parts in total. Converting to weight means $200 \text{ g} : 300 \text{ g}$. This means Daniel must have gotten 200 g of chocolate.

15

A

- A** is correct. We need to follow the order of operations. We start with the brackets, $12 - 5 = 7$. Then we multiply this result by 12. $12 \times 7 = 84$. We then subtract 9 from this answer. Hence $84 - 9 = 75$.
- B** is incorrect as 130 is the answer you get when you ignore the brackets so it becomes $144 - 5 - 9 = 130$.
- C** is incorrect as you have ignored the brackets so it becomes $12 \times -2 = -24$.
- D** is wrong due to calculation error
- E** is wrong due to calculation error

Tip: Make sure you follow BODMAS; brackets first then multiplication, division and then addition, subtraction.

16	C	A is not correct as it is the time the friend gets home on London time. B is not correct as it is the time 17 hours ahead, however in PM time not AM time. This means this answer is actually 29 hours ahead. C is correct. The friend gets home at 30 minutes after 5:30 pm, so they get home at 6:00 pm. Since Sydney is 17 hours ahead of London, this means the time that you should call your friend is 17 hours + 6:00 pm, so it means you should call your friend at 11 am. D is incorrect as it is 17 hours BEFORE the friend gets home. E is incorrect as it is 17 hours before they get home on PM time. Tip: Make sure you know if its PM or AM when deciding the final answer. Also make sure the time is ahead rather than behind when calculating time.
17	C	A is wrong as you have undercounted by 6 edges. B is wrong as you have undercounted by 2 edges. C is correct as a cube has a total of 12 edges. There are 4 edges each on the top face and the base, making 8. Then there are 4 vertical edges. Thus a cube has a total of $8 + 4 = 12$ edges. D is wrong as you have overcounted by 2 edges. E is wrong as you have overcounted by 4 edges. Tip: Draw out the cube on paper. Then count the number of edges.
18	D	A is incorrect as this is the number of matchsticks in step 1 B is incorrect as this is the number of matchsticks in step 2 C is incorrect as this is the number of matchsticks for step 5 D is correct. This is because at each step, another box is added at the end of each segment. So an extra 4 boxes will be added which equals to 12 extra straws each step. From step 1, there is 16, step 2 has 28 and step 3 has 40. This means step 4 requires $40 + 12 = 52$ E is wrong as this is the number of matchsticks in step 3. Tip: Draw out the straws and count them. Then find a pattern to make it easier how many straws will be added in each step. If in doubt count everything.
19	C	A is wrong as it is another decimal too much. This is if you do the multiplication incorrectly. B is wrong as you did not cancel out the negatives when multiplying C is the answer. Make sure that the negatives cancel out and it is a positive number. D is wrong as it is another decimal more and you did not cancel out the negatives. E is wrong as it is too high of a number. It is one less decimal. Tip: When doing these multiplications, ensure you do not miss a step so that the decimals will be correct. You can always take into account of the negatives at the end and if there are 2 negatives, you can cancel them out for a positive!
20	B	A is wrong as even though you have correctly divided $250/12$, you have rounded down. If you visualise it, after 20 days, there will still be a

few kg of cement left that you haven't used up, so you actually haven't run out of cement yet.

B Is correct. There is 250 kg of cement available for use and 12 kg of cement is used every day. Hence we can divide 250 by 12 to give us the number of days. This results in 20.83333 days. We need to round up to 21 days to give us a whole number of days.

C is wrong as due to calculation error.

D is wrong due to calculation error.

E is wrong due to calculation error.

Tip: Make sure you read the question and consider what it is actually asking.

21

C

A is incorrect as if we add $\frac{3}{9} + \frac{3}{9} + \frac{2}{9}$, the result is $\frac{8}{9}$. There is still pizza left, which is incorrect as Luke ate the rest.

B is incorrect as if we add $\frac{2}{9} + \frac{3}{9} + \frac{2}{9}$, the result is $\frac{7}{9}$. There is still pizza left, which is incorrect as Luke ate the rest.

C is correct. Peter ate $\frac{2}{9}$ of the pizza while Jamie ate $\frac{1}{3} = \frac{3}{9}$ of the pizza. This means there is $\frac{9}{9} - \frac{2}{9} - \frac{3}{9} = \frac{4}{9}$ of a pizza left. Hence Luke ate $\frac{4}{9}$ of the pizza.

D is wrong as this is more than what both Peter and Jamie ate combined.

E is wrong as this is more than what both Peter and Jamie ate combined.

Tip: Convert the fractions to have the same number on the bottom (denominator). This will make it easy to subtract and add the fractions.

22

B

A is wrong because 5 months $\times$ 5 mm = 25 mm. This is not long enough.

B is correct. Since we know the bean sprout grows 5 mm every month, this means that for the bean sprout to grow to a length of 30 mm, it will take $30 \text{ mm} / 5 \text{ mm} = 6$ months.

C is wrong because 7 months $\times$ 5 mm = 35 mm. This is too long.

D is wrong because 8 months $\times$ 5 mm = 40 mm. This is too long.

E is wrong because 9 months $\times$ 5 mm = 45 mm. This is too long.

Tip: Keep in mind that you can easily check the answer by just multiplying out each answer option by 5 mm. If it doesn't equal 30 mm, the answer is wrong.

23

E

A is wrong as $\frac{3}{3} = 1$ and 1 is not the difference between the original number of triangles and circles.

B is wrong as 4 cannot be divided by 3 without a remainder.

C is wrong as 4 cannot be divided by 3 without a remainder.

D is wrong as 5 cannot be divided by 3 without a remainder.

E is correct. We know that the number of triangles we have now is equal to the difference of the original number of triangles and circles, multiplied by 3. Since the difference between the original number of triangles and circles is equal to $6 - 4 = 2$, this means the number of triangles we have now is equal to $2 \times 3 = 6$.

Tip: Try eliminate as many of the same shapes/variables and then you can isolate which shapes equal each other.

24

B

A

is wrong as $93 \times 17 = 1581$

B

is correct. You need to perform long division for this question:

$$\begin{array}{r} 92 \\ 17 \overline{) 1564} \\ \underline{153} \\ 34 \end{array}$$

$$17 \times 9 = 153$$

C

is wrong as $91 \times 17 = 1547$

D

is wrong as $90 \times 17 = 1530$

E

is wrong as $89 \times 17 = 1513$

Tip: You can try multiply each number and try get 1564 if you are not confident with performing long division with really large numbers.

25

A

A

is correct. Taking a close look at the graph we can see the number of televisions sold in July was 7. The number of televisions sold in June was 6. This means the difference in the number of television sold was $7 - 6 = 1$.

B

is wrong as the difference was 1.

C

is wrong as the difference was 1.

D

is wrong as the difference was 1.

E

is wrong as the difference was 1.

Tip: Read the question and understand it is looking for the difference of two values.

26

B

A

is wrong as this is the age of Jessica, not Sue.

B

is correct. This is a ratio question. We know that Sue is twice the age of Jessica, so essentially it is a ratio of 2:1 in terms of age. This means there is a total of $2 + 1$ parts = 3 parts. Divide 60 years by 3 gives you 20 years, which is 1 part. This means Jessica is 20 years old and hence Sue is 40 years old.

C

is wrong as this would mean Jessica is 7.5 years old so $7.5 + 15 = 22.5$, which is not 60 years.

D

is wrong as this means Jessica is 15 years old. $15 + 30 = 45$ years which is not 60 years.

E

is wrong as this means Jessica is 17.5 years old. $17.5 + 35 = 52.5$, which is not 60 years old.

Tip: You can check your answer by adding up Sue and Jessica's age. If it doesn't equal 60 years, it has to be wrong.

27

C

A

is wrong as it is the number of strawberries after 1 month

B

is wrong due to calculation error.

C

is correct as the amount of months between January of this year and January of the next year is 12 months. Since the farmer harvests 200 strawberries every month, this is a simple case of multiplying 200 by 12 months, giving us a total of 2400 strawberries harvested over this 12 month period.

D

is wrong as it is the number of strawberries after 6 months.

E

is wrong as it the number of strawberries after 11 months.

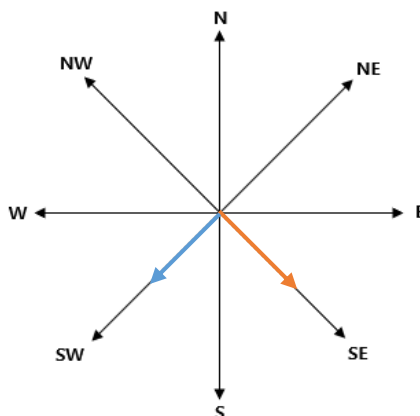
Tip: Make sure you read the question properly. The interval between January this year and January next year is 12 months.

28	A	A is correct. We know that we paid \$375 for a phone that was half price. This means the full price of the phone must be twice that of what we paid. Hence to find the full price of the phone we need to multiply 375 by 2. $375 \times 2 = \\$750$, which is the correct answer. B is wrong as you have misinterpreted the question and divided the price by 2 instead of multiplying it by 2. C is wrong as $500/2 = \\$250$ not \$375 D is wrong as $650/2 = \\$325$ not \$375 E is wrong due to calculation error. Tip: Make sure you read the question carefully to realise that we are looking for the full price of the phone.
29	A	A is the correct answer. You need to first rearrange all seven scores in order. This gives us 15, 52, 57, 65, 69, 75, 75. The median value means the middle value so we can see that this is 65. Hence 65 is the median score. B is wrong. This is higher than the median score. C is wrong as this is the highest score of the set. D is wrong as this is the second lowest score of the set. E is wrong as it is the lowest score in the set. Tip: Make sure you know what median is. Then you should make sure you rearrange the numbers in order or else you will not get the proper median score.
30	B	A is wrong due to calculation error. B is correct as this is essentially a rates question but worded. We know that 1 man takes 10 minutes to change 4 tyre. The question asks how long would that take if we had 2 men instead of just 1. Since we doubled the number of men, we need to half the time as the number of tyres stay the same. This means 10 minutes is halved to give us 5 minutes. C is wrong due to calculation error. D is wrong due to calculation error. E is wrong due to calculation error. Tip: Make sure you break down the question into 3 different parts. The number of men, the number of tyres and the time taken. This makes it a lot easier to understand the problem.
31	E	A is wrong as the total number of users is 29 thousand B is wrong as there is 1000 more users in the 2nd quarter than the 1st. Not 1. You need to read the graph in thousands. C is wrong as the number of users fall back down going from the 3rd to 4th quarter. D is wrong as it increases in users from the 2nd quarter to the 3rd, not the other way around. E is correct as we see that for the 1st quarter, there were 4000 users. For the 2nd quarter there were 5000 users. For the 3rd quarter there were 13000 users. For the 4th quarter there were 7000 users. Thus it is correct that the 4th quarter had the 2nd highest number of users registering for an account.

Tip: Read the graph and see what the units are in. The metric used in this graph was in thousands so that will affect your answer.

32

B



B is correct. Keith was facing Southeast, which is 135 degrees to the true bearing. If he turns 90 degrees to his right, this means his final bearing is $135 + 90 = 225$ degrees. This is equivalent to Southwest.

Tip: Drawing out a compass diagram is the best way to visualise and solve this question. It makes really easy to see what is the correct final direction and prevents silly mistakes.

33

A

A is correct as Todd's speed is 20 km/h. Andrew's speed is 10 km/h. $20/10 = 2$, so Todd is travelling twice as fast as Andrew and hence will finish twice as quickly, which is a half of Andre's time.

- B is wrong as Todd took a half of Andrew's time
 C is wrong as Todd took a half of Andrew's time
 D is wrong as Todd took a half of Andrew's time.
 E is wrong as we do have enough information.

Tip: Remember that speed is directly proportional to time, so if something going twice as fast will reach something twice as quickly.

34

B

A is wrong.

B is correct. In order to figure out how many rabbits were on day 1, we have to consider that every day, you need to multiply by 3. Hence we work backwards so that to get to day 1, we divide by 3 every day. Hence it becomes $2700/3/3/3$ or $2700/27 = 100$. Thus there were 100 rabbits on at the start, 300 at the end of the 1st day, 900 at the end of the second and 2700 at the end of the third.

- C is wrong.
 D is wrong.
 E is wrong.

Tip: You need to make sure that you are dividing every successive day by the rate (3) and continue to do so until you reach the first day.

35

A

A To find this answer, you have to calculate the brackets first then deal with the other mathematical operators. Thus the equation becomes $36 \div 6 = 6$. Hence A is the correct answer.

- B is incorrect. This will occur because you have ignored the brackets and divided 36 by 7 and then subtracted 1.
- C is incorrect due to calculation error.
- D is incorrect due to calculation error.
- E is incorrect due to calculation error.

Tip: Remember that you must follow BODMAS: brackets first then multiplication/division then addition/subtraction.