TAGIHAN
ASISTENSI MENGAJAR
MATHEMATICS FOR INTERNASIONAL SCHOOL
SOAL HOTS DAN PEMBAHASANNYA

Oleh:

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PROGRAM STUDI PENDIIKAN MATEMATIKA

FAKULTAS KEGURUAN DAN ILMU PENDIDIKAN

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KEMENTERIAN PENDIDIKAN, KEBUDAYAAN, RISET, DAN TEKNOLOGI

2023

1. All students in class VIII H of MTsN 2 Bondowoso will use computers. If each computer is used by 3 students, then there will be 2 students who will not use a computer, whereas if each computer is used by 4 students, then there will be 5 computers that will not be used. The total number of computers owned by the madrasah is
2. Ahmad is currently performing the Umrah pilgrimage. One of the rituals of Umrah is Tawaf. Ahmad walks along a route of 100 meters from the center of the Kaaba at a constant speed of 12 km/h. How much time does Ahmad spend performing Tawaf?
3. Alif and Idris will perform the Friday prayer. They live in the same house and will pray at the same mosque. Alif leaves by walking, taking 440 steps to reach the mosque, with each of his steps measuring 0.8 meters. Meanwhile, Idris wants to go tothe mosque using his motorbike. If the diameter of the motorcycle's wheel is 70 cm, how many rotations of the motorcycle wheel does Idris need to reach the mosque?
4. Constantinople became the capital of the Roman Empire during the reign of Constantine the Great in 330. Following the collapse of the Western Roman Empire in the late 5^{Th} century, Constantinople remained the capital of the Eastern Roman Empire. Constantinople had strong defenses; the city featured a highly renowned defensive wall. This defensive wall consisted of three layers, with the innermost wall reaching a height of 12 meters and a wall thickness of 5 meters. At a distance of 20 meters from the inner wall, there was a second wall with a height of 8.5 meters and a thickness of 2 meters. Additionally, there was another wall on the outermost part. Determine the distance between the top of the inner wall and the wall in the middle of the city of Constantinople!
5. The committee creates a square pyramid-shaped 'tumpeng' as part of the celebration of the Prophet Muhammad's birthday. The 'tumpeng' has a square base with side length 30 cm and a height of 30 cm. Due to its excessive height, the 'tumpeng' is eventually cut in half horizontally at a distance of 10 cm from its base. The surface area of the cut portion is?
6. Lichen or crustose lichen is one of the moss types that live on rocks. One uniqueness of lichens is their clustered form. Clustered lichens create circular patterns. We can observe these lichens in cold regions such as Greenland. Due to global warming on our planet, ice in polar and surrounding areas melts, revealing rocky surfaces. Crustose lichens then grow on these rocks. The colony of lichen, resembling a circle, expands after 12 years of ice melting, following the pattern:

$$d = 7 \times \sqrt{t - 12}\ dengan\ t \geq 12$$

Here, d represents the diameter of the lichen colony in meters, and t is the time period in years after the ice has melted.
Determine the age of the lichen if its diameter is 84 meters!

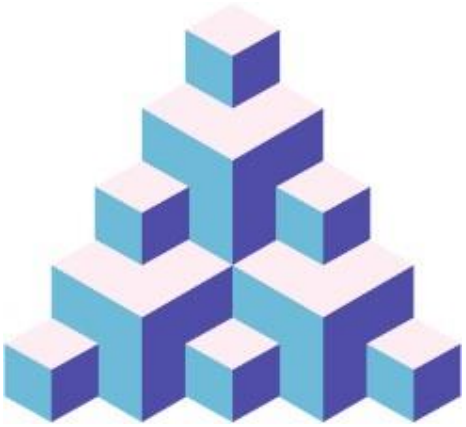
Answer key

We can substitute 84 into the known formula, so we can write:

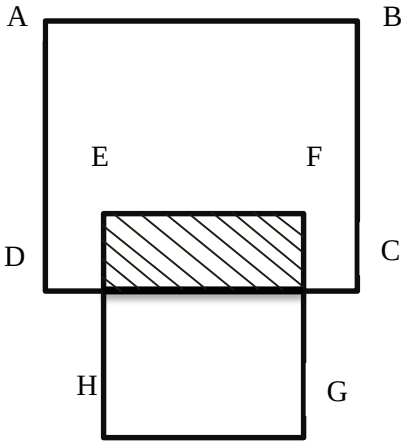
$$84 = 7 \times \sqrt{t - 12}$$
$$\sqrt{t - 12} = \frac{84}{7}$$
$$\sqrt{t - 12} = 12$$

$$t - 12 = 12^2$$
$$t - 12 = 144$$
$$t = 144 + 12$$
$$t = 156$$

So, the age of the lichen is 156 years.

7. Four numbers form an arithmetic sequence. If the first and second numbers remain constant and the third number, when added to the first number, and the fourth number, when multiplied by 2, form a geometric sequence. If the common differenceof the terms in the arithmetic sequence is 4, then the sum of the first 4 numbers in the geometric sequence is
8. 

During the math lesson, the teacher challenges the students to determine the total volume of a stack of two types of cubes as shown in the image above. The small cube has a side length of 5 cm, and the large cube has a side length of 8 cm. What is the volume of the stack of cubes?

9. In a election for the chairperson of the MSC Mathematics Association, which consists of 3 candidates, the results were quite unique. The election results are consecutive odd numbers with a total of 309 valid votes. Determine the total votes for each candidate from 1 to 3!
10. 

There are two overlapping plane figures, namely a square and a rectangle. The length of AB is 12 cm, while the length of EF is 5 cm and EH is 10 cm. The area of the unshaded

region is known to be 156 cm^2. Determine the area of the unshaded region!

11. Stocks can be defined as a form of capital participation by an individual or entity (business entity) in a company or limited liability company. By contributing this capital, the party has a claim to the company's income, a claim to the company's assets, and the right to attend the Annual General Meeting of Shareholders. Stocks can be purchased per lot (100 shares each). If the price of BCA stocks per share is 8,600 Indonesian Rupiah at the beginning of November 2023, 9050 at 15 November 2023 and has risen to 9,400 by the end of December 2023, what is the profit that can be gained if 1 lots of BCA stocks are purchased in beginning of November, 1 lots again of BCA stocks are purchased in 15 November 2023 and sold at the end of December?
12. PT Petrindo Jaya Kreasi (CUAN) is a limited liability company engaged in the energy sector, specifically in the subsector of coal mining. The stock price of PT Petrindo Jaya Kreasi experienced a significant increase in the year 2023. At the beginning of the offering, the stock price of CUAN was 240 per share. The company's stocks rose to 13,750 per share on December 1, 2023. Calculate the percentage increase in the stock price of PT Petrindo Jaya Kreasi (CUAN)?
13. Mr. Bambang has three children. They currently reside in Sofifi City, the capital of North Maluku Province. One day, Mr. Bambang gave 600,000 Indonesian Rupiah to his three children. The second child received 25,000 Rupiah more than the third child. The first child received three times as much as the second child. What is the share for each child?
14. Space Exploration Technologies Corporation (SpaceX) is a private American space transportation company founded by Elon Musk. The company has developed the Falcon rocket family with the goal of creating reusable launch vehicles. In 2023, SpaceX launched a rocket. The height h meters of the rocket t seconds after launch is expressed as

    $$h = xt - yt^2$$

    The rocket's height after 2 seconds is 40 meters, and the height after 3 seconds is 42 meters. Determine the values of x and y!
15. Tony and Mario are two friends from different countries. Tony lives in Sydney (Australia), and Mario lives in Berlin (Germany). They communicate through WhatsApp. Tony learns that Mario is only allowed to use a smartphone by his parents after returning from school, which is at 14:00 Berlin time. To find a suitable time for chatting, Tony checks the world clock guide and discovers that when it's 01:00 in Berlin, it's 10:00 in Sydney. At what time can Mario contact Tony?

ANSWER KEY

1. Let x be the number of computers and y be the number of students. Given that
   $3x + 2 = y \rightarrow 3x - y = -2$
   $4(x - 5) = y \rightarrow 4x - 20 = y \rightarrow 4x - y = 20$
   Then
   $3x - y = -2$
   $\underline{4x - y = 20}$

$-x = -22$
$x = 22$

2. First, let's calculate the route for one round of Ahmad using the circumferenceformula for a circle."

$$K = 2\pi r = 2 \times 3{,}14 \times 100 = 628\, meter$$

While Tawaf consists of 7 rounds, the total route length for Ahmad's Tawaf is

$$628 \times 7 = 4.396\, meter$$

3. First, let's find the distance from their house to the mosque, which is

$$440 \times 0{,}8 = 352\, meter = 35200\, cm$$

After that, we determine the circumference of the wheel $K = \frac{22}{7} \times 70 = 220$

So, the number of rotations is $\frac{35200}{220} = 160$

4. To find the distance between the tops of the walls, we can use the Pythagorean theorem.

Given: the height of the first wall is 12 meters, and the height of the second wall is 8.5 meters.

So, the difference in height is 12 - 8.5 = 3.5 meters.

$$x = \sqrt{20^2 + 3{,}5^2} = \sqrt{400 + 12{,}25} = \sqrt{412{,}25}$$

5. Since the 'tumpeng' is cut at a height of 10 cm, the length of the side at that height is20 cm. Therefore, the surface area of the cut portion is $20 \times 20 = 400\ cm^2$

6. We can substitute 84 into the known formula, so we can write:

$$84 = 7 \times \sqrt{t - 12}$$
$$\sqrt{t - 12} = \frac{84}{7}$$
$$\sqrt{t - 12} = 12$$
$$t - 12 = 12^2$$
$$t - 12 = 144$$
$$t = 144 + 12$$
$$t = 156$$

So, the age of the lichen is 156 years.

7. 4 arithmetic sequence

Let's Assume

The first number : a
The second number : $a + b$
The third number : $a + 2b$
The fourth number : $a + 3b$

4 geometric sequence

The first number : a
The second number : $a + b$
The third number : $a + 2b + a = 2a + 2b$

The fourth number : $(a + 3b) \times 2 = 2a + 6b$

Substitute the value $b = 4$

The first number : a

The second number : $a + 4$

The third number : $2a + 8$

The fourth number : $2a + 24$

We can use the ratio formula

$$\frac{U_1}{U_2} = \frac{U_3}{U_4}$$
$$\frac{a}{a+4} = \frac{2(a+4)}{2(a+12)}$$
$$\frac{a}{a+4} = \frac{a+4}{a+12}$$
$$a^2 + 12a = a^2 + 8a + 16$$
$$4a = 16$$
$$a = 4$$

Substitute the value $a = 4$

The first number: 4

The second number: 8

The third number: 16

The fourth number: 3

8. First, let's calculate the number of large and small cubes in the picture. It turns out there are 4 large cubes and 6 small cubes, so the total volume is

$$V_b = S \times S \times S = 8 \times 8 \times 8 = 512\ cm^3$$
$$V_k = S \times S \times S = 5 \times 5 \times 5 = 215\ cm^3$$
$$512 + 215 = 727\ cm^3$$

9. We can use the arithmetic series formula. Let's assume the three numbers as

$$2n + 1, 2n + 3, 2n + 5$$

Thus, the sum of the three numbers can be expressed as

$$2n + 1 + 2n + 3 + 2n + 5 = 309$$
$$6n + 9 = 309$$
$$6n = 309 - 9$$
$$6n = 300$$
$$n = \frac{300}{6}$$
$$n = 50$$

So,

the total votes for candidate 1 is $2(50) + 1 = 100 + 1 = 101$

the total votes for candidate 1 is $2(50) + 3 = 100 + 3 = 103$

the total votes for candidate 1 is $2(50) + 5 = 100 + 5 = 105$

10. From the above figure, it is evident that the shaded region is located on both plane figures. Therefore, the area of the shaded region will be counted twice. Thus, we can express it as follows:

$L = The\ area\ of\ the\ square + The\ area\ of\ the\ rectangle - 2 \times$

$The\ unshaded\ area$

$156 = (12 \times 12) + (5 \times 10) - 2 \times The\ unshaded\ area$

$156 = 144 + 50 - 2 \times The\ unshaded\ area$

$156 = 194 - 2 \times The\ unshaded\ area$

$2 \times The\ unshaded\ area = 194 - 156$

$2 \times The\ unshaded\ area = 38$

$The\ unshaded\ area = \frac{38}{2}$

$The\ unshaded\ area = 19\ cm$

11. First, we need to calculate how many BCA stocks were purchased in November. One lot was bought at a price of 8,600, so we bought it for 8,600 × 100 = 860,000 Indonesian Rupiah. Additionally, we bought another lot on November 15 at a price of 9,050, so the cost was 9,050 × 100 = 905,000. Therefore, we purchased 2 lots of BCA stocks for a total of 860,000 + 905,000 = 1,765,000 Rupiah.

    Subsequently, we sold 2 lots of stocks at a price of 9,400 per share or 9,400 × 100 = 940,000 Rupiah. This means we received 940,000 × 2 = 1,880,000 Rupiah from the sale. Consequently, the profit from selling BCA stocks is calculated as 1,880,000 - 1,765,000 = 115,000 Rupiah.

12. To find the percentage increase in its stock price, we can use the formula:

$$x = \frac{Final\ Price - Initial\ Price}{Initial\ Price} \times 100$$

$$x = \frac{13.750 - 240}{240} \times 100$$

$$x = \frac{13.510}{240} \times 100$$

$$x = 5.629\%$$

    Jadi kenaikan harga saham PT Petrindo Jaya Kreasi adalah 5.629%

13. Let's assume the third child received x rupiah, so

    $the\ second\ child's\ money\ =\ x\ +\ 25$

    $the\ first\ child's\ money\ =\ 3(x\ +\ 25)\ =\ 3x\ +\ 75$

    Since the total amount given is 600,000 Rupiah, we can write:

$$x\ +\ (x\ +\ 25)\ +\ (3x\ +\ 75)\ =\ 600$$

$$(x\ +\ x\ +\ 3x)\ +\ (25\ +\ 75)\ =\ 600$$

$$5x\ +\ 100\ =\ 600$$

$$5x\ =\ 600\ -\ 100$$

$$5x\ =\ 500$$

$$x\ =\ 100$$

    Therefore, we conclude that:

    $the\ first\ child's\ money = x = 100$

    $the\ second\ child's\ money = x + 25 = 100 + 25 = 125$

14. Diketahui tinggi setelah roket meluncur 2 detik adalah 40 meter sedangkan tinggi roket setelah meluncur 3 detik adalah 42 meter

    Kita bisa subtitusikan menghasilakan persamaan pertama

$$h = xt - yt^2$$
$$40 = x(2) - y(2^2)$$
$$40 = 2x - 4y$$
$$2x - 2y = 40$$

Dan persamaan kedua

$$h = xt - yt^2$$
$$45 = x(3) - y(3^2)$$
$$45 = 3x - 9y$$
$$3x - 9y = 45$$

Kita bisa eliminasi nilai x

$2x - 2y = 40 \quad \times 3$

$3x - 9y = 42 \quad \times 2$

$6x - 6y = 120$

$\underline{6x - 18y = 84}$ $-$

$12y = 36$

$y = 3$

Setelah itu kita subtitusi y ke persamaan pertama

$2x - 2(3) = 40$

$2x - 6 = 40$

$2x = 40 - 6$

$2x = 34$

$x = 17$

15. If it's 01:00 in Berlin and equivalent to 10:00 in Sydney, there is a time difference of $10 - 1 = 9$ hours, with Sydney being ahead. If Tony is only allowed to use his smartphone at 14:00 in Berlin, then Mario can contact him at $14 + 9 = 23{:}00$ Sydney time.