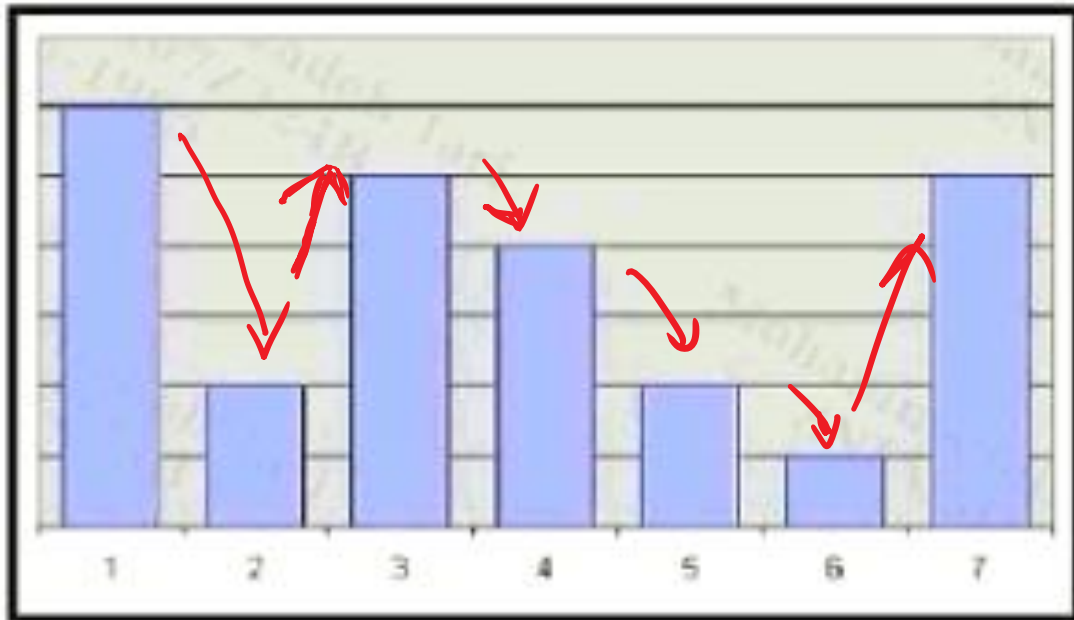


Tolc i { Mathematics → 20 (50')
Logic → 10 (20')
Science → 10 (20') { 6 Physics
4 Chemistry
Reading Comprehension → 10 (20')

20 من ← از 50 من 5 سوال

Find which of the following sets of data is represented in the following histogram, where the ordinates have been omitted.

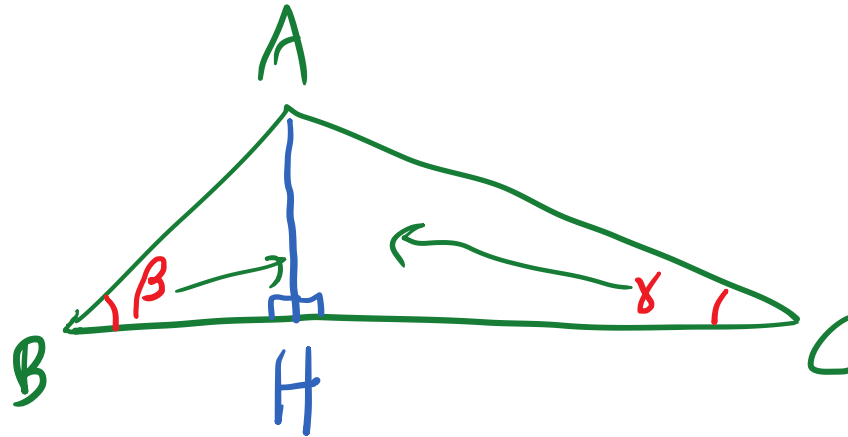


- ☒ A.
- | category | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|----------|-----|-----|-----|-----|-----|-----|-----|
| value | 718 | 716 | 710 | 718 | 716 | 712 | 712 |
- ☒ B.
- | category | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|----------|-----|-----|-----|-----|-----|-----|-----|
| value | 714 | 718 | 714 | 708 | 710 | 708 | 716 |
- ☒ C.
- | category | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|----------|-----|-----|-----|-----|-----|-----|-----|
| value | 716 | 722 | 712 | 716 | 716 | 712 | 720 |
- ☒ D.
- | category | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|----------|-----|-----|-----|-----|-----|-----|-----|
| value | 720 | 710 | 714 | 710 | 712 | 712 | 712 |
- ☒ E.
- | category | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|----------|-----|-----|-----|-----|-----|-----|-----|
| value | 720 | 712 | 718 | 716 | 712 | 710 | 718 |

Let ABC be a triangle, and let H be the foot of the altitude from the side BC . Let β denote the amplitude of angle $\widehat{ABC}$, and let γ denote the amplitude of angle $\widehat{ACB}$.

Determine which of the following expressions gives the length of the altitude AH , independently of the triangle ABC .

- ☐ A. $AC \cdot \tan \gamma$
- ☐ B. $AC \cdot \cos \gamma$
- ☒ C. $AB \cdot \sin \beta$
- ☐ D. $AB \cdot \cos \beta$
- ☐ E. $AC \cdot \sin \beta$



$$\sin \gamma = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{AH}{AC}$$

$$AC = AC \sin \gamma$$

$$\sin \beta = \frac{AH}{AB}$$

$$AH = AB \sin \beta$$

The correct ordering of the numbers

is

$$\begin{array}{cccc} \frac{\pi}{2} & \frac{2}{\pi} & \frac{2}{\pi^2} & \frac{3}{5} \\ \downarrow & \downarrow & \downarrow & \downarrow \\ 1.5 & 0.67 & 0.22 & 0.6 \end{array}$$

$\nearrow \frac{2}{9}$

$$\pi \approx 3.14 \approx \textcircled{3}$$

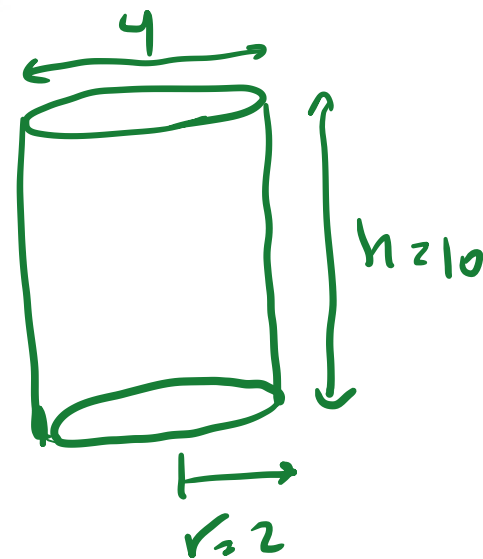
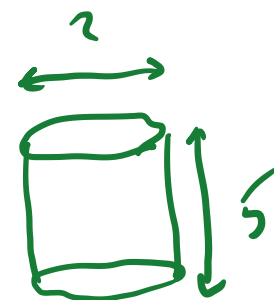
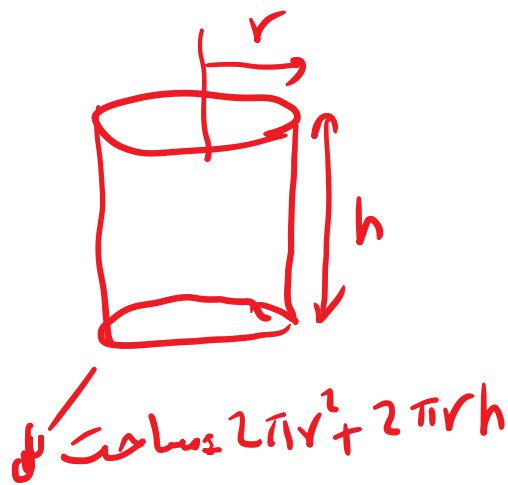
- ☐ A. $\frac{2}{\pi^2} < \frac{3}{5} < \frac{\pi}{2} < \frac{2}{\pi}$
- ☐ B. $\frac{2}{\pi} < \frac{2}{\pi^2} < \frac{3}{5} < \frac{\pi}{2}$
- ☒ C. $\frac{2}{\pi^2} < \frac{3}{5} < \frac{2}{\pi} < \frac{\pi}{2}$
- ☐ D. $\frac{\pi}{2} < \frac{2}{\pi} < \frac{3}{5} < \frac{2}{\pi^2}$
- ☐ E. $\frac{2}{\pi^2} < \frac{2}{\pi} < \frac{3}{5} < \frac{\pi}{2}$

$$\frac{2}{\pi^2} < \frac{3}{5} < \frac{2}{\pi} < \frac{\pi}{2}$$

$$\begin{aligned} \sqrt{2} &\approx 1.4 \\ \sqrt{3} &\approx 1.7 \\ \sqrt{5} &\approx 2.2 \end{aligned}$$

قطر = دو برابر شعاع

Two cylindrical tanks are given. The first one has a base diameter of 2 m and a height of 5 m. The second one has base diameter and height both equal to the double of the previous one. Determine the total surface area of the greater of the two tanks.



- ☐ A. $36\pi \text{ m}^2$
- ☒ B. $48\pi \text{ m}^2$
- ☐ C. $24\pi \text{ m}^2$
- ☐ D. $12\pi \text{ m}^2$
- ☐ E. 150.72 m^2

$\frac{d}{2} = \text{radius}$

$$\begin{aligned} \text{مساحت کل} &= 2 \times \pi \times 2^2 + 2\pi \times 2 \times 10 \\ &= 8\pi + 40\pi = 48\pi \end{aligned}$$

Determine which of the following fractions is equal to

$$\frac{1}{\sqrt[5]{3}\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}} \times \frac{\sqrt[5]{3^4}}{\sqrt[5]{3^4}} = \frac{\sqrt{7} \times \sqrt[5]{81}}{3 \times 7}$$

$$= \frac{\sqrt{7} \sqrt[5]{81}}{21}$$

$$\sqrt[5]{3^5} = \textcircled{3}$$

- ☐ A. $\frac{\sqrt{7}\sqrt[5]{81}}{7}$
- ☐ B. $\frac{\sqrt{7}\sqrt[5]{3^3}}{21}$
- ☐ C. $\frac{\sqrt{7}\sqrt[5]{3^4}}{147}$
- ☐ D. $\frac{\sqrt{7^2}\sqrt[5]{81}}{21}$
- ☒ E. $\frac{\sqrt{7}\sqrt[5]{81}}{21}$

$$\frac{1}{\sqrt[4]{5} \sqrt{2}} = ?$$

$$\frac{1}{\sqrt[4]{5} \sqrt{2}} \times \frac{\sqrt[4]{5^3}}{\sqrt[4]{5^3}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt[4]{125} \times \sqrt{2}}{\underbrace{5 \times 2}_{10}} = \frac{\sqrt[4]{125} \sqrt{2}}{10}$$

$$ax^2 + bx + c = 0$$

$$\Delta = b^2 - 4ac \longrightarrow x_{1,2} = \frac{-b \pm \sqrt{\Delta}}{2a}$$

$$\Delta > 0 \xrightarrow{\text{دو ریشه حقیقی}} -\frac{b + \sqrt{\Delta}}{2a} \text{ , } -\frac{b - \sqrt{\Delta}}{2a}$$

$$\Delta = 0 \xrightarrow{\text{یک ریشه مضاعف}} -\frac{b}{2a}$$

$$\Delta < 0 \longrightarrow \text{ریشه حقیقی نداریم}$$

The function

$$y = \frac{|x - 1|}{x + 1}$$

is defined for

$$x + 1 \neq 0$$
$$x \neq -1$$

- ☐ A. $x > 0$
- ☐ B. $x > -1$
- ☐ C. every real number x
- ☐ D. $x \geq 1$
- ☒ E. $x \neq -1$

Let x and y be two real numbers such that

$x = 4$ and $|y| \leq 3 \longrightarrow$

Then one can deduce that

$$-3 \leq y \leq 3$$

$$3 \geq -y \geq -3$$

$$x+3 \geq x-y \geq x-3$$

$$7 \geq x-y \geq 1$$

- ☐ A. $-7 \leq x - y \leq 3$
- ☐ B. $3 \leq x - y \leq 7$
- ☒ C. $1 \leq x - y \leq 7$
- ☐ D. $-1 \leq x - y \leq 1$
- ☐ E. $-3 \leq x - y \leq 3$

عبارت
The expression

$$(3 \sin x)^2$$

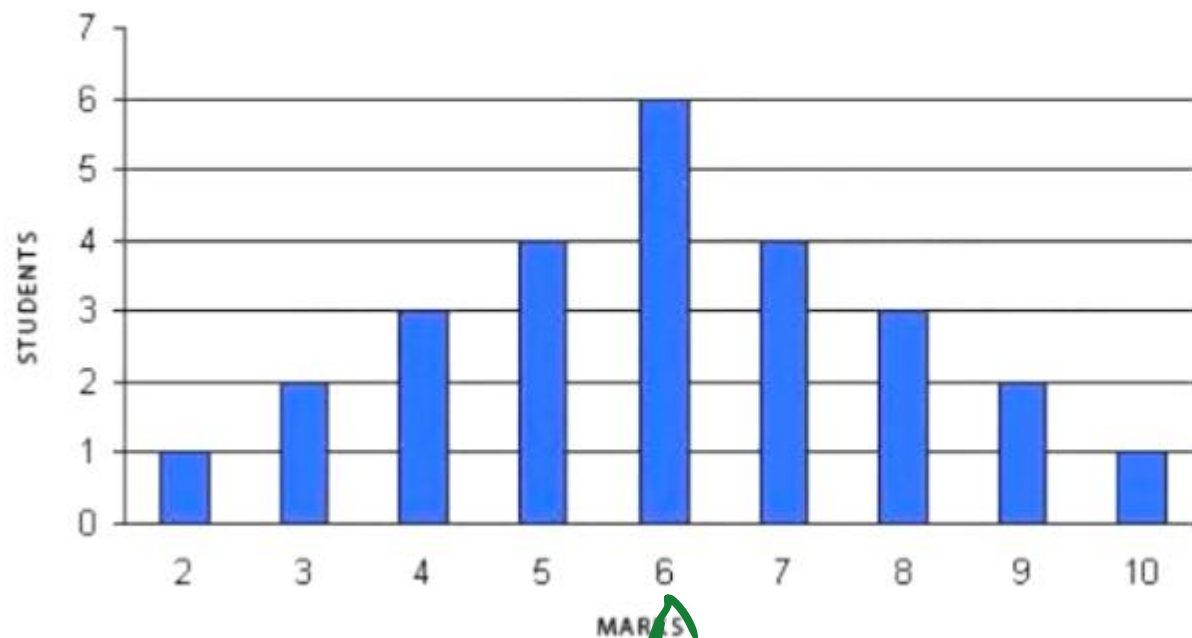
represents

نشانہ دہندہ

- ☐ A. the square of the sine of the triple of x
- ☒ B. the square of the triple of the sine of x
- ☐ C. the triple of the square of the sine of x
- ☐ D. the triple of the sine of the square of x
- ☐ E. the sine of the triple of the square of x

مربع سے برابر سینوس کا مربع →

The graph reports the marks obtained by a group of students in a math test.



What is the average mark?

- ☐ A. 7
- ☐ B. 5,5
- ☐ C. 5
- ☒ D. 6
- ☐ E. 6,5

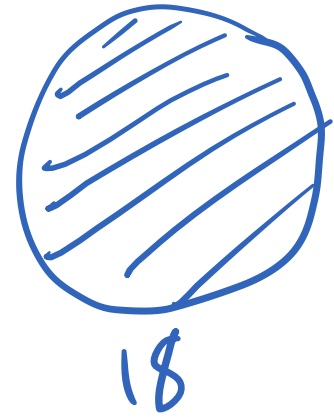
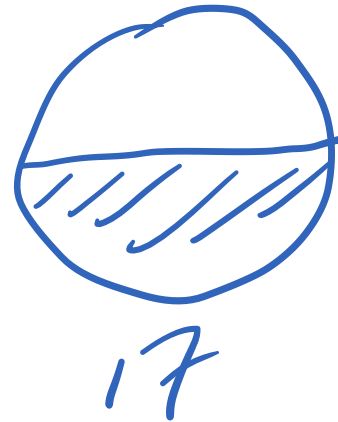
راه حلای =
$$\frac{1 \times 2 + 2 \times 3 + 3 \times 4 + 4 \times 5 + \dots}{1 + 2 + 3 + 4 + 6 + 4 + \dots}$$

راه ساده: در داده های متغیر، میانگین و میان در وسط قرار دارد

A bacterial population falls into a tank containing saline and begins to grow. Every day the occupied surface doubles. In 18 days it has occupied the whole surface of the tank. After how many days did it occupy half the surface of the tank?

دوباره برسی شود

- ☐ A. 9
- ☐ B. 12
- ☒ C. 17
- ☐ D. It depends on the initial number of bacteria
- ☐ E. It depends on the surface occupied initially



Let a be a real number different from zero. Then the expression

is equal to

- ☐ A. $(\log |a|)^2$
- ☐ B. $2 \log a$
- ☐ C. $(\log a)^2$
- ☐ D. $2 \log |a|$
- ☐ E. $\log 2 + \log |a|$

$2 \log |a|$ ← $\log(a^2)$

$\log a^n = n \log |a|$ ← عدد زوج

$\log a^n = n \log a$ ← عدد فرد

نکته: داخل لگاریتم باید همواره مثبت باشد

Let a and b be any two positive numbers.

Determine which of the following relations is always true.

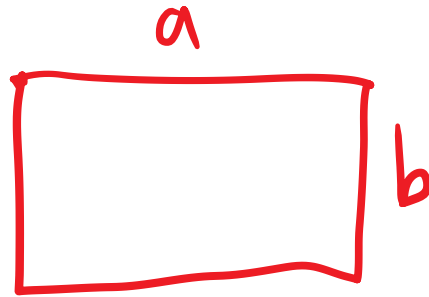
- ☒ A. $2^{a+b} = 2^a \cdot 2^b$
- ☐ B. $\sqrt{a+b} = \sqrt{a} + \sqrt{b}$
- ☐ C. $\frac{1}{a+b} = \frac{1}{a} + \frac{1}{b}$
- ☐ D. $(a-b)^3 = a^3 - b^3$
- ☐ E. $2^{a+b} = 2^a + 2^b$

$$\begin{array}{ccc} b & c & b+c \\ a \times a & = & a \end{array}$$

$$\begin{array}{ccc} b & & b \\ a \times c & = & (ac)^b \end{array}$$

The area of a rectangle is 90 cm^2 , and the ratio between the two sides is $5 : 2$.
Then the perimeter of the rectangle is

- ☐ A. $14/5 \text{ cm}$
- ☐ B. 14 cm
- ☐ C. 38 cm
- ☐ D. 21 cm
- ☒ E. 42 cm



$area = \text{length} \times \text{width}$

$$ab = 90$$
$$\frac{a}{b} = \frac{5}{2} \rightarrow a = \frac{5}{2}b$$
$$\frac{5}{2}b \cdot b = 90 \rightarrow \frac{5}{2}b^2 = 90$$
$$b^2 \rightarrow \frac{2}{5} \times \frac{18}{1} = 36 \rightarrow \boxed{b = 6} \rightarrow a = \frac{5}{2} \times 6 = 15$$

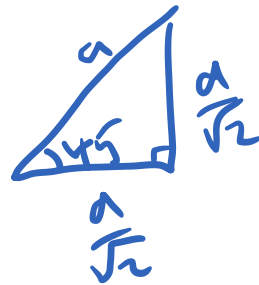
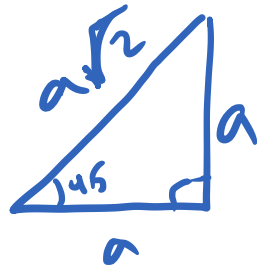
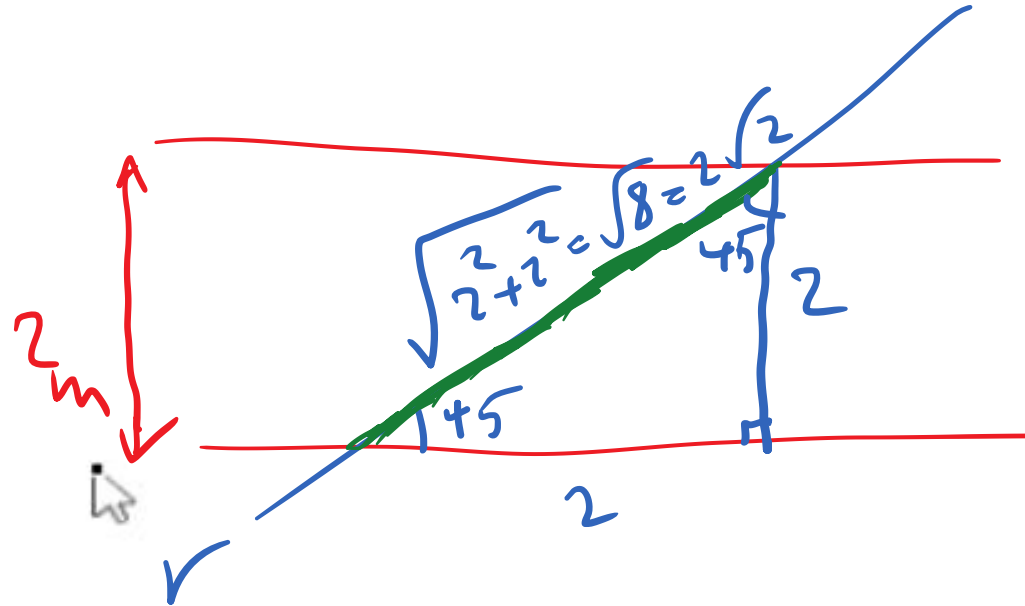
$a = 15$

The distance between two parallel lines in the plane is 2 m.

A third line r intersects the two parallel lines forming acute angles whose measure is 45° .

Determine the length of the line segment formed on r by the two parallel lines.

- ☐ A. 4 m
- ☐ B. $2\sqrt{3}$ m
- ☐ C. $\sqrt{2}$ m
- ☐ D. 2 m
- ☒ E. $2\sqrt{2}$ m



در مثلث قائم الزاویه منتهای المماس قرصه، برابر دو ساق است