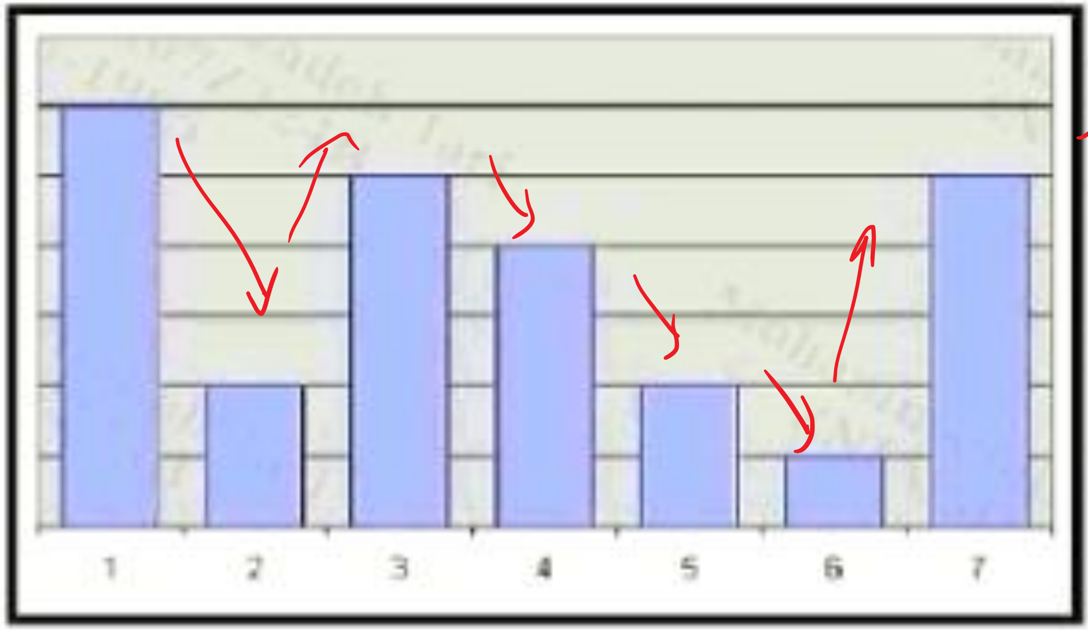
زکآ

20	Mathmatics			→ 50′
10	Logic			→ 20′
10	Science	6	Physics	→ 20′
		4	Chemistry	
10	Reading Comprehension			→ 20′

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.

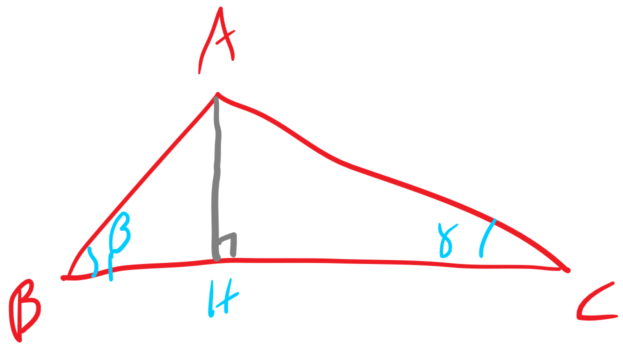
category	1	2	3	4	5	6	7
value	720	712	718	716	712	710	718

قدم ارتفاع ضلع

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. $AC \cdot \sin\beta$



$$\sin\gamma = \frac{AH}{AC}$$

$$AH = AC\sin\gamma$$

$$\cos\gamma = \frac{HC}{AC} \quad \times$$

$$\cos\beta = \frac{BH}{AB} \quad \times$$

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

The correct ordering of the numbers

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

is

1.5 0.67 0.22 0.6

$\pi \simeq 3.14 \longrightarrow \pi \simeq 3$

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

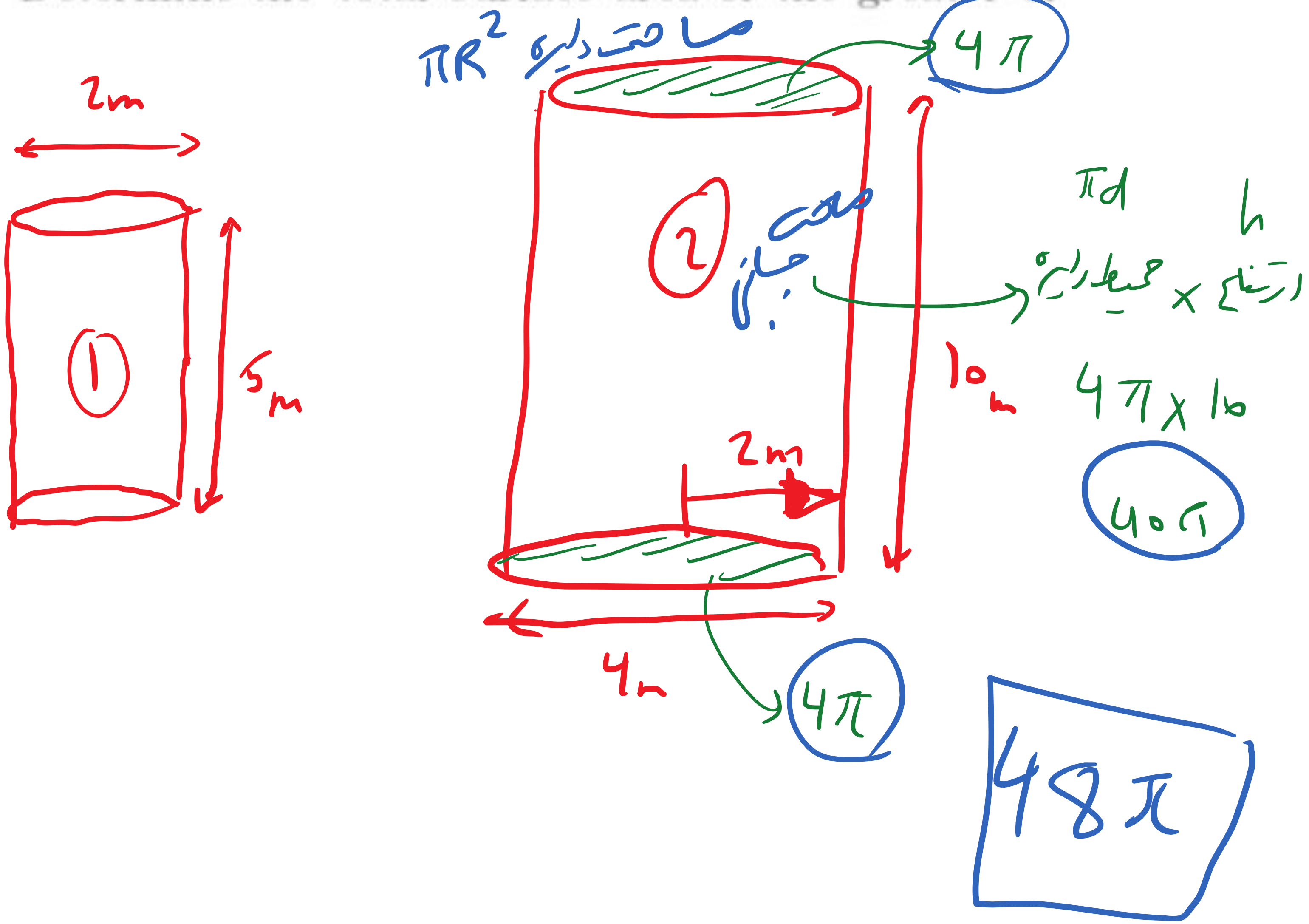
$$\frac{2}{\pi^2} < \frac{3}{5} < \frac{2}{\pi} < \frac{\pi}{2}$$

$\sqrt{2} \simeq 1.4$

$\sqrt{3} \simeq 1.7$

$\sqrt{5} \simeq 2.2$

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. 36π m^2
- B. 48π m^2 ✓
- C. 24π m^2
- D. 12π m^2
- E. 150.72 m^2

Determine which of the following fractions is equal to

$$\frac{1}{\sqrt[5]{3}\sqrt{7}}$$

A. $\dfrac{\sqrt{7}\sqrt[5]{81}}{7}$

B. $\dfrac{\sqrt{7}\sqrt[5]{3^3}}{21}$

C. $\dfrac{\sqrt{7}\sqrt[5]{3^4}}{147}$

D. $\dfrac{\sqrt{7^2}\sqrt[5]{81}}{21}$

✓ E. $\dfrac{\sqrt{7}\sqrt[5]{81}}{21}$

$$\frac{1}{\sqrt[5]{3}\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}} \times \frac{\sqrt[5]{3^4}}{\sqrt[5]{3^4}} = \frac{\sqrt{7} \times \sqrt[5]{81}}{3 \times 7} = \frac{\sqrt{7}\sqrt[5]{81}}{21}$$

7

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

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

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

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

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

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

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

$\Delta<0 \longrightarrow$ ریشه حقیقی نداریم

The number of real distinct solutions to equation

$ax^2 + 2x + 1 = 0$ $\qquad b=2 \qquad c=1 \qquad \Delta = 4-4a$

(in the unknown x) is

برای اینکه دو ریشه داشته باشد؟ $\qquad \Delta>0 \rightarrow 4-4a>0 \rightarrow 4a<4$

$a<1$

دو ریشه

- A. one if $a < 1$
- B. two if $a > 1$
- C. zero if $a > 0$
- D. two for every real number a
- E. two if $0 < a < 1$

$\hookrightarrow \Delta>0$

The function

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

is defined for

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

- 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 $|y| \leq 3$

Then one can deduce that

- 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. $-3 \leq x - y \leq 3$

$|y| \leq 3 \rightarrow -3 \leq y \leq 3$

$3 \geq -y \geq -3$

$-3 \leq -y \leq 3$

$+x$

$+4$

$4 - 3 \leq x - y \leq 4 + 3$

$\boxed{1 \leq x - y \leq 7}$

DAAN ACADEMY

The expression

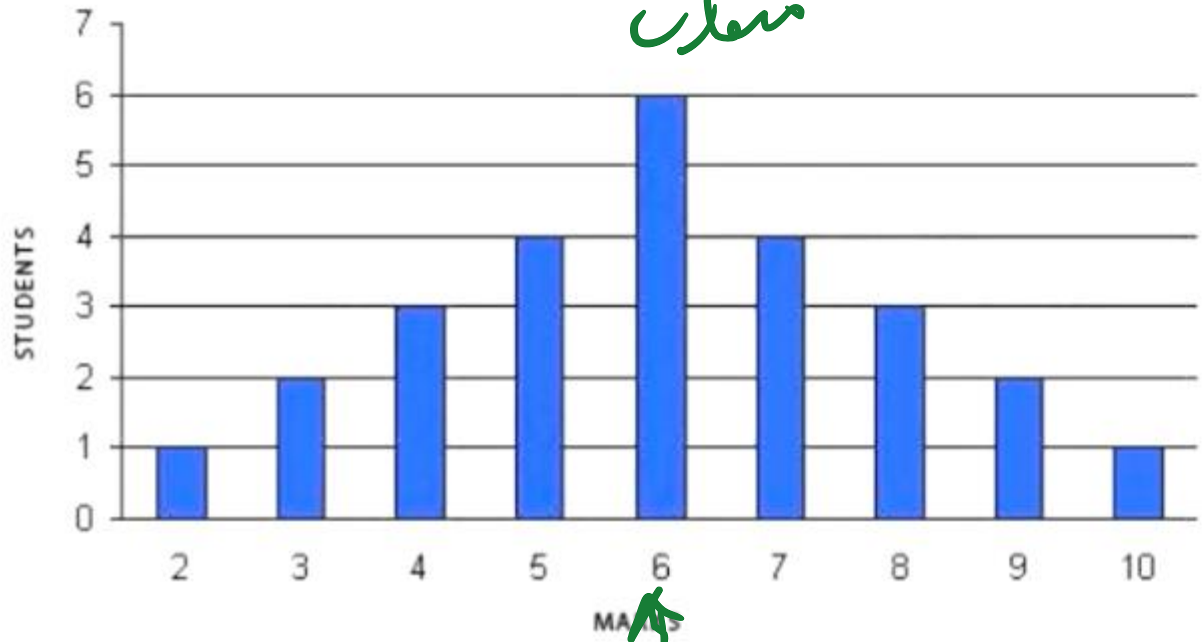
$$(3\sin x)^2$$

represents

- A. the square of the sine of the triple of x — مربع سینوس سه برابر x
- B. the square of the triple of the sine of x — مربع سه برابر سینوس x
- C. the triple of the square of the sine of x — سه برابر مربع سینوس x
- D. the triple of the sine of the square of x — سه برابر سینوس مربع x
- E. the sine of the triple of the square of x — سینوس سه برابر مربع x

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

متقارن



$$\frac{2\times 1+3\times 2+4\times 3+\cdots}{1+2+3+\cdots}$$

راه طولانی

What is the average mark?

- A. 7
- B. 5,5
- C. 5
- D. 6 ✓
- E. 6,5

در داده‌های متقارن، میانگین و میانه در وسط داده‌ها 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?

- 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

$$\log\left(a^2\right)$$

$-5 \to (-5)^2 = 25$

is equal to

$2\log|a|$

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

عدد زوج

$\log a^n = n\log|a|$

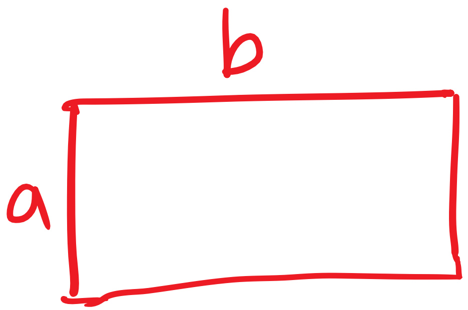
عدد فرد

$\log a^n = n\log a$

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. $\dfrac{1}{a+b} = \dfrac{1}{a} + \dfrac{1}{b}$
- D. $(a-b)^3 = a^3 - b^3$
- E. $2^{a+b} = 2^a + 2^b$

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



$ab = 90$

$\frac{b}{a} = \frac{5}{2} \rightarrow 5a = 2b$

$a = \frac{2}{5} b$

$\frac{2}{5} b \times b = 90$

$b^2 = \frac{5 \times \cancel{90}^{45}}{\cancel{2}} = 225 \rightarrow \boxed{b = 15} \rightarrow \boxed{a = 6}$

$2a + 2b = 12 + 30 = 42$

A. 14/5 cm

B. 14 cm

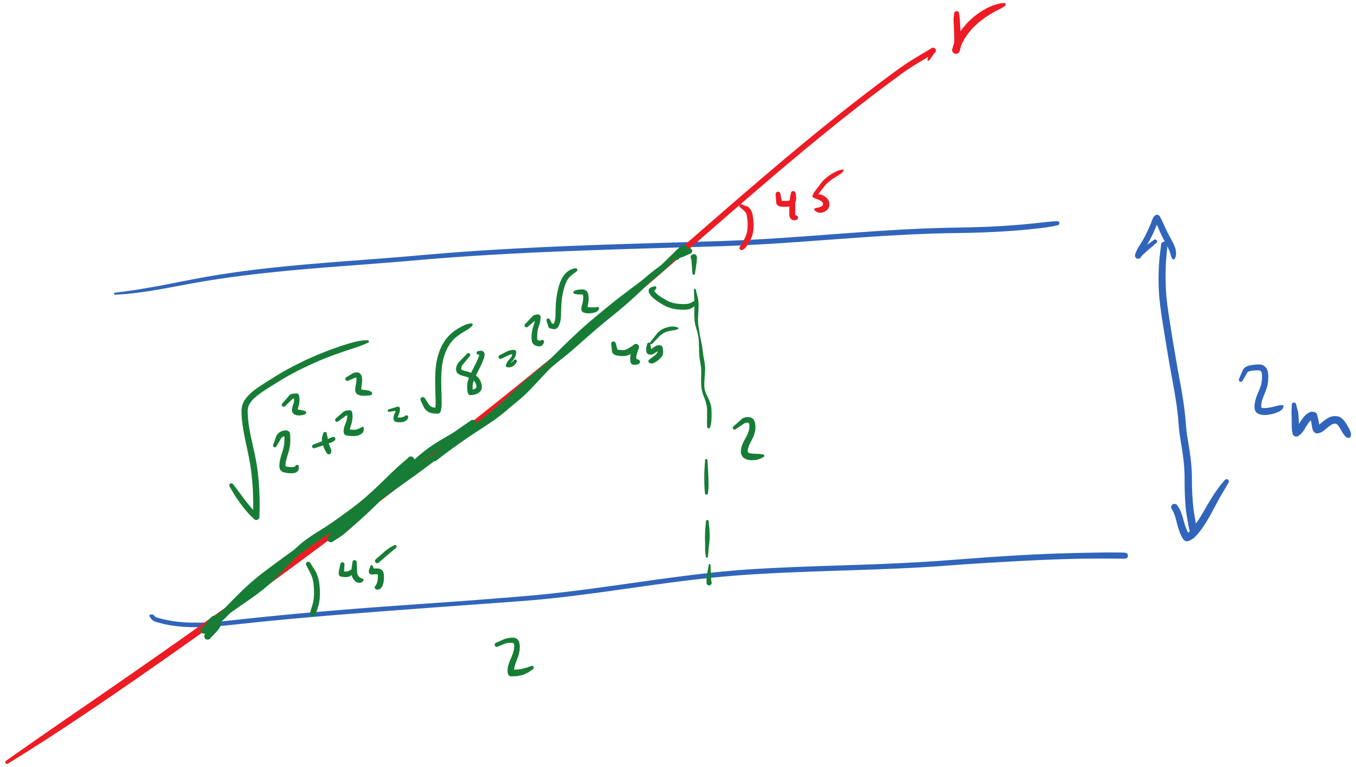
C. 38 cm

D. 21 cm

E. 42 cm ✓

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 ✓



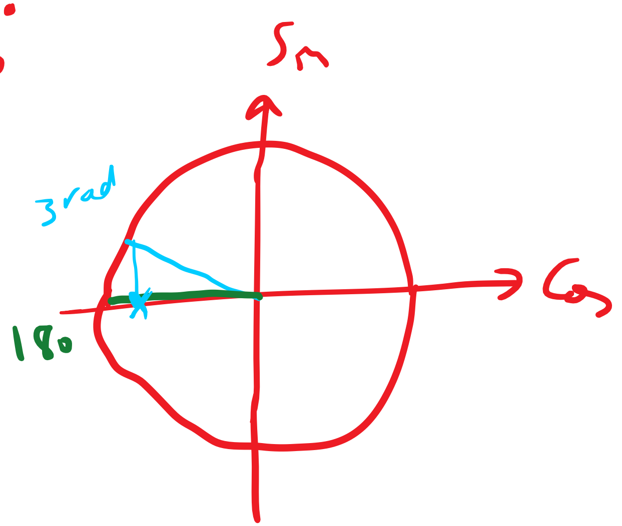
If the measure α of an angle is 3 radians, then

$3.14 \simeq \pi \text{ rad} = 180^\circ$

- A. $\cos\alpha < 0$ ✓
- B. $\tan\alpha > 0$
- C. $\sin\alpha < \tan\alpha$
- D. $\sin\alpha = \dfrac{1}{2}$
- E. $\cos\alpha = \dfrac{1}{10}$

$3 \text{ rad} \simeq 170^\circ$

$\cos 3^{\text{rad}} < 0$



محدب

In a convex quadrilateral of vertices A, B, C, D the angles in the opposite vertices A and C are right angles. Then the angles in B and in D are

A. both acute angles

B. both obtuse angles

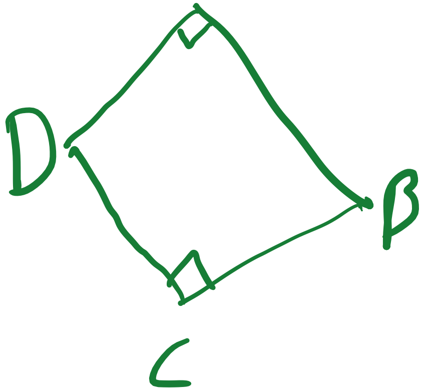
C. for sure both right angles

D. for sure one is the double of the other

E. supplementary ✓

$A+B=180$ Supplementary مکمل

$A+B=90$ متمم Complentary



مجموع زوایای داخلی هر چهارضلعی $= 360^\circ$

$$\overset{90}{A}+B+\overset{90}{C}+D=360 \rightarrow \boxed{B+D=180}$$

دو زاویه مکمل هستند → Supplementary

The equation

$\sqrt[4]{x} = 4$ $\longrightarrow$ $x = 4^4 = 256$ ✓

has

- A. no real solution
- B. four real solutions
- ✓ C. one real solution
- D. two positive real solutions
- E. two real solutions with opposite sign

حرفه‌ای مالیات عایدی

A professional must pay a 20% tax on any remuneration he receives. What gross remuneration does a net amount of 500 euros correspond to?

خالص

- A. 375 euro
- B. 625 euro ✓
- C. 400 euro
- D. 600 euro
- E. 100 euro

$$x \xrightarrow{\text{20 درصد کم}} 500$$

$$x \times 0.8 = 500$$

$$x = \frac{500}{0.8} = 625$$

The number $\sqrt[8]{16}$ is equal to

A. $\sqrt{2}$

B. $2\sqrt[8]{4}$

C. $\sqrt[4]{8}$

D. 4

E. 2

$$\sqrt[8]{16} = (16)^{\frac{1}{8}} = (2^4)^{\frac{1}{8}} = 2^{\frac{4}{8}} = 2^{\frac{1}{2}}$$

$$= \sqrt{2}$$

The solution of the inequality

$$x^2(x-1) \geq 0$$

is

$x^2 \geq 0 \rightarrow x = 0$

بقیه جاها مثبت است

$x - 1 \geq 0 \rightarrow \boxed{x \geq 1}$

- A. $x \geq 1$ or $x = 0$
- B. $x \geq 1$
- C. $x \leq 0$ or $x \geq 1$
- D. $x \leq -1$ or $x = 0$
- E. $0 \leq x \leq 1$

If

$$f(x) = 3^{2x+1}$$

then $f(x-1)$ is equal to

$$f(x-1) = 3^{2(x-1)+1} = 3^{2x-2+1} = 3^{2x-1}$$

در f بجای x از $x-1$ استفاده کنیم

A. 3^{2x}

B. 3^{-1}

C. $3^{2x+1} - 1$

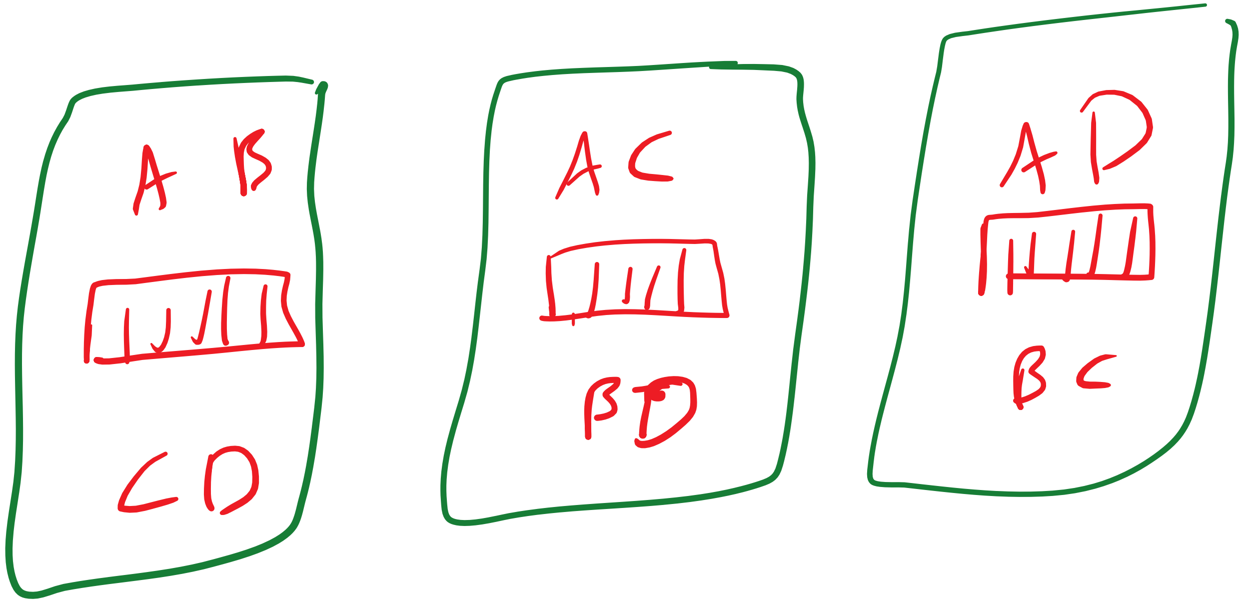
D. $f\left(3^{2x+1} - 1\right)$

E. 3^{2x-1} ✓

With 4 tennis players, how many "doubles" matches, with different pairs, can be played?

A, B, C, D

- A. 12
- B. 6
- C. 16
- D. 3 ✓
- E. 10



ax^2+bx+c

The polynomial

$(x^2+1)(x^2-x-6)$

is divisible by

- A. $x+3$
- B. $x-2$
- C. $x-1$
- D. $x+2$ ✓
- E. $x+1$

$x^2+1 \rightarrow \begin{cases} a=1 \\ b=0 \\ c=1 \end{cases}$ $\Delta = 0^2 - 4 = -4 < 0$

ریشه ندارد

$x^2-x-6 \rightarrow \begin{cases} a=1 \\ b=-1 \\ c=-6 \end{cases}$ $\Delta = 1-4(1)(-6) = 25$

$x = \dfrac{-b \pm \sqrt{\Delta}}{2a} = \dfrac{1 \pm 5}{2}$

$x = 3 \rightarrow (x-3)$

$x = -2 \quad (x+2)$

$(x^2+1)(x-3)\underline{\underline{(x+2)}}$

Equality

$\frac{a}{b} \geq 0$

$b \neq 0$

$$\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$$

$a \geq 0$

$b > 0$

is true

$a = -4$

$b = -1$

$\frac{a}{b} = \frac{-4}{-1} = 4$

$\sqrt{4} = 2$

$\frac{\sqrt{-4}}{\sqrt{-1}}$ X

A. only if $\frac{a}{b} \geq 0$

B. for every real value of a and b

C. only if $\frac{a}{b} \geq 0$, $b \neq 0$

D. only if $a \geq 0$, $b > 0$ ✓

E. for no real value of a and b

In the Cartesian plane, find the equation of the line passing through point (2, 1) and perpendicular to the line with equation

$$y = \frac{1}{2}x.$$

از نقطه $(2,1)$ می‌گذرد

عمود

حاصل ضرب شیبها $= -1$

ضریب x = شیب خط

- A. $2x + y - 5 = 0$ ✓
- B. $2x + y - 4 = 0$
- C. $2x - y - 3 = 0$
- D. $x - 2y = 0$
- E. $x + 2y - 4 = 0$

$$y = mx + a$$
$$y = nx + b$$

$\xrightarrow{\text{شرط عمود بودن}}$ $\boxed{mn = -1}$

$m = \frac{1}{2}$ $\qquad n \times \frac{1}{2} = -1 \rightarrow n = -2$

معادله خط با شیب n که از (a,b) می‌گذرد:

$$y - b = n(x - a)$$

$$y - 1 = -2(x - 2) \rightarrow y - 1 = -2x + 4 \rightarrow y + 2x = 5$$

$$\boxed{2x + y - 5 = 0}$$

$0, \pm 1, \pm 2, \pm 3, \ldots$ عدد صحيح

فرد زوج

Let m and n be two positive integers such that $3m = 4n$.

زوج زوج

Determine which of the following statements is certainly true.

جمع

- A. The sum $m + n$ is odd
- B. The product mn is odd
- C. The sum $m + n$ is even
- D. The product mn is even
- E. n is odd ضرب

زوج

$m \times n =$ زوج

ضرب زوج بفرد

The number $x = \log_2 18$

- A. is greater than 4 and less than 5
- B. is equal to 9
- C. is less than 4
- D. is negative
- E. is greater than 5

$\log_2 16 = \log_2 2^4 = 4$

18

$\log_2 32 = \log_2 2^5 = 5$

After three exams a university student has an average of 24/30. In the fourth exam he reports the mark of 30/30. What is your average after the four exams?

- A. 25.5/30
- B. Data are not enough to answer
- C. 26.5/30
- D. 27/30
- E. 25/30

مجموع ۳ امتحان اول

میانگین ۳ امتحان اول $M_3 = \frac{\sum 3}{3} = 24 \rightarrow \sum 3 = 3 \times 24 = 72$

میانگین ۴ امتحان $M_4 = \frac{\sum 4}{4} = \frac{\sum 3 + 30}{4} = \frac{72 + 30}{4} = 25.5$

In a statistical analysis concerning the adoption of minors abroad, the wives of the married couples who applied were divided by age groups. The corresponding histogram of the frequencies, referred to a certain year, is given in the figure. The examination of this histogram shows that the average age of the wife is between

- A. 35 and 39
- B. 30 and 34
- C. 27 and 30
- D. 40 and 44
- E. 45 and 49

Among the four following data sets

$\cancel{S} = \{-1, 0, 1\}$,
$\cancel{T} = \{-2, 0, 2\}$,
$\cancel{X} = \{-1, 0, 2\}$,
$Y = \{-2, 1, 2\}$

which one has the greatest variance?

واریانس → نمادی برای نمایش دوربودن از میانگین

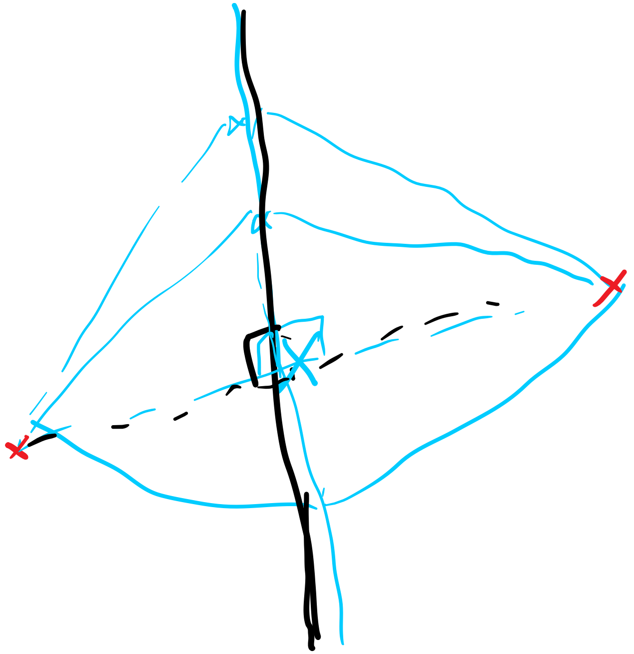
→ واریانس بیشتر

- A. X and Y
- ✓ B. Y
- C. T
- D. S
- E. X

In the plane, the locus of points with the same distance from two given distinct points is

مجموعه نقاط با یک خاصیت مشترک

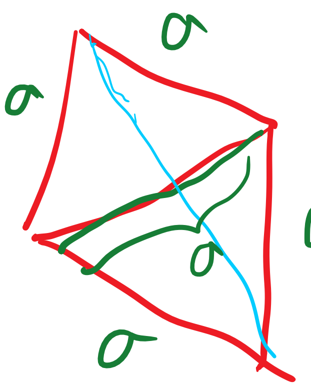
- A. two perpendicular lines
- B. an oval
- C. one or two lines, depending on the position of the two points
- D. a line
- E. an ellipse

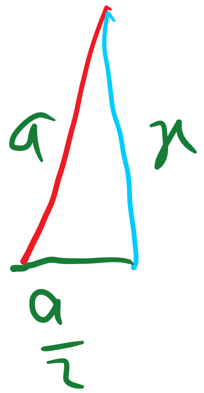


If a rhombus has a diagonal equal to the side, the other diagonal is

لوزی — قطر

- A. independent of the previous data and therefore arbitrary
- B. $\sqrt{2}$ times the side
- C. the double of the side
- D. equal to the side
- E. $\sqrt{3}$ times the side ✓





$x = \frac{a}{2}\sqrt{3}$

پس قطر $= 2x = a\sqrt{3}$

$x^2 + \left(\frac{a}{2}\right)^2 = a^2$

$x^2 + \frac{a^2}{4} = a^2 \rightarrow x^2 = \frac{3a^2}{4}$

The numbers $(k = 0, \pm 1, \pm 2, \ldots)$

$$x = \pm\frac{\pi}{2} + 2k\pi$$

are solutions of one of the following equations. Which one?

A. $\cos x + \cos 2x = 0$

B. $\tan 2x = 3\tan x$

C. $\sin x + \sin 2x = 0$

D. $\cot 2x = 1 + \cot x$

E. $\sin 2x - \cos x = 0$

The average daily sales of drinks in a certain bar are shown in the following table.

Type	Average number of sales
Coffee	60
the	25
cappuccino	30
soft drinks	40
juice	20
sodas	25

$= 200 \xrightarrow{\times 0.25} 50$

The bar manager decides to increase the price of drinks whose average daily sales exceed 25% of the total. Which drinks increase in price?

- A. No drink
- B. All drinks, but for juices
- C. Coffee, cappuccino, soft drinks
- D. Coffee only ✓
- E. All drinks

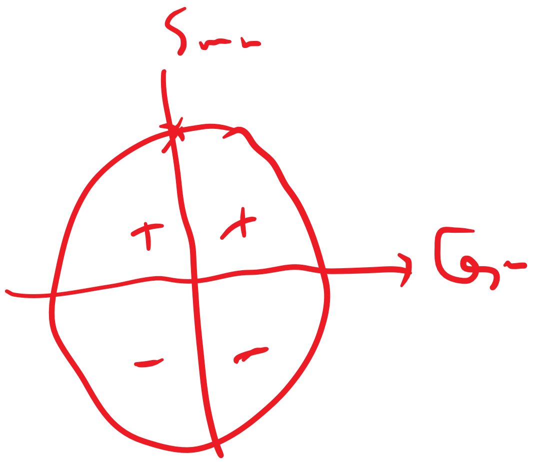
If a real number x, with $0 \le x \le 2\pi$, satisfies the inequality

$$\overbrace{(1-\sin x)}^{+}\,\overbrace{\sin x}^{+} > 0$$

then

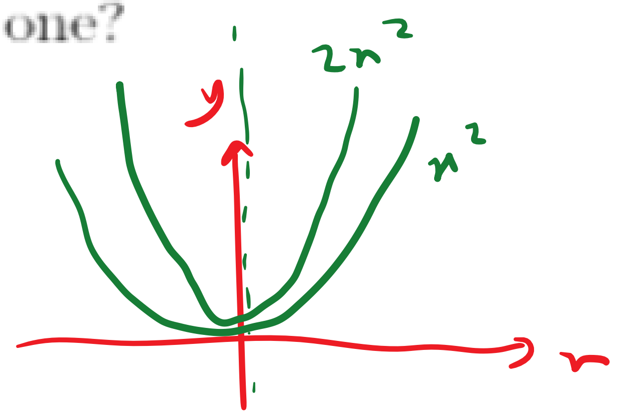
$\sin x \le 1 \longrightarrow 1 - \sin x \ge 0$

$x \ne \frac{\pi}{2}$

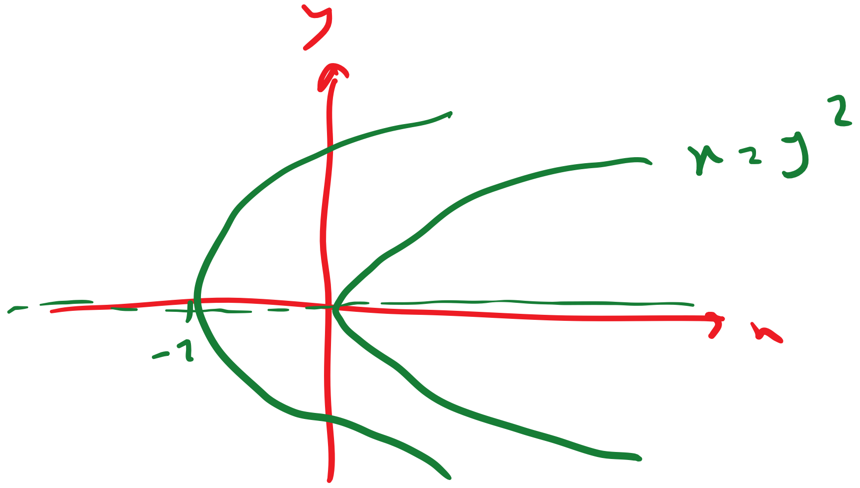


- A. $x = \pi/2$
- B. $0 < x < \pi$
- C. $0 \le x \le \pi$
- D. $0 < x < \pi/2$
- E. $0 < x < \pi,\ x \ne \pi/2$ ✓

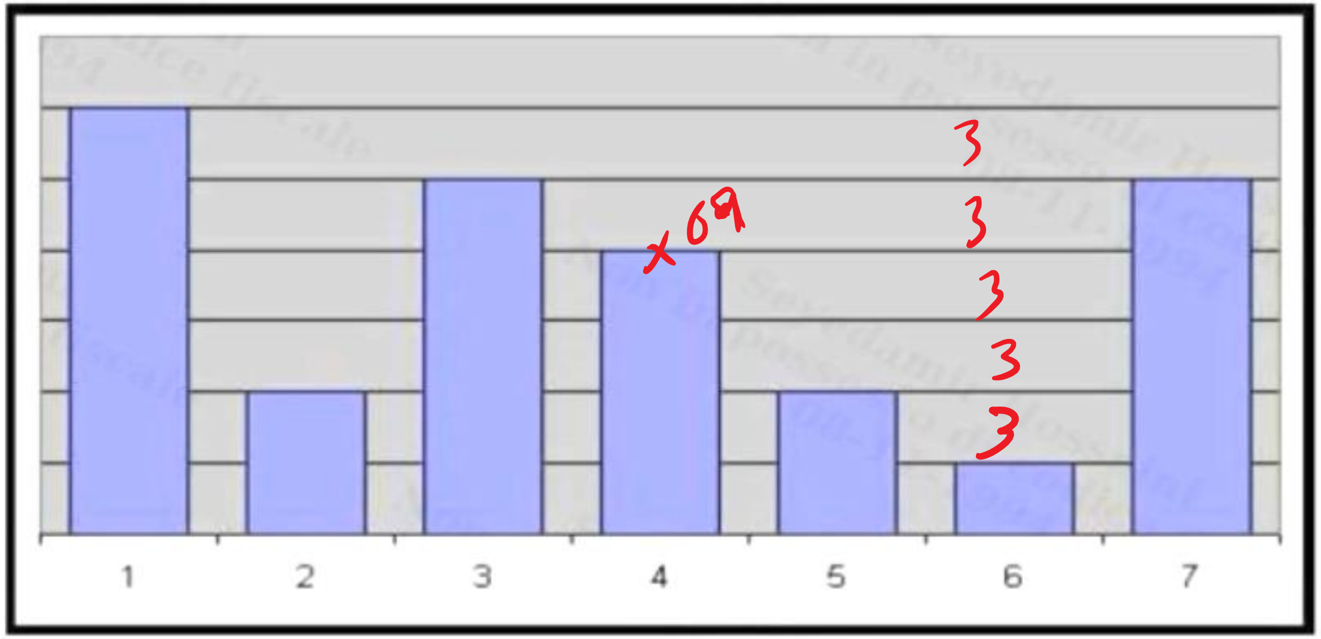
In the Cartesian plane, only one of the following equations represents a parabola with the axis parallel to the x axis. Which one?



- A. $x^2 + 2xy + y^2 - x = 1$
- B. $x^2 - 2xy = 1$
- C. $y^2 = x + 2$
- D. $y = 3x - 1$
- E. $y = 2x^2$



In the histogram in the figure the minimum value is 60 units and the maximum value is 75 units. How much is the value number 4?



A. 69 units

B. 66 units

C. 72 units

D. 71 units

E. 70 units

Let α be the measure in radians of an angle, with $\pi/2 < \alpha < \pi$. If

$\rightarrow \sin\alpha > 0$

$$\cos\alpha = -\frac{1}{4}$$

then

$$\sin\left(\alpha + \frac{\pi}{4}\right)$$

is equal to

$\boxed{\sin(a+b) = \sin a\cos b + \sin b\cos a}$

$\sin^2\alpha + \cos^2\alpha = 1 \rightarrow \sin^2\alpha + \left(-\frac{1}{4}\right)^2 = 1$

$\sin^2\alpha + \frac{1}{16} = 1 \rightarrow \sin^2\alpha = \frac{15}{16}$

$\boxed{\sin\alpha = \frac{\sqrt{15}}{4}}$

$\sin\alpha = -\frac{\sqrt{15}}{4}$ X

- A. $\frac{-1-\sqrt{15}}{4\sqrt{2}}$
- B. $-\frac{3}{4}$
- C. $\frac{1-\sqrt{15}}{4\sqrt{2}}$
- D. $\frac{1+\sqrt{15}}{4\sqrt{2}}$
- ✓ E. $\frac{-1+\sqrt{15}}{4\sqrt{2}}$

$\sin\left(\alpha+\frac{\pi}{4}\right) = \sin\alpha\cos\frac{\pi}{4} + \sin\frac{\pi}{4}\cos\alpha = \frac{\sqrt{15}}{4}\frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}}\left(-\frac{1}{4}\right)$

$= \frac{-1+\sqrt{15}}{4\sqrt{2}}$

The inequality

$$\frac{1}{x-1} + \frac{2(x+2)}{x^2-1} + \frac{1}{x+1} > 0$$

is satisfied for

- A. $x > -1$
- B. $x < 0$
- C. every real number x
- D. $x > 1$
- E. $x \neq \pm 1$

$$\frac{x+1+2x+4+x-1}{(x-1)(x+1)} > 0$$

$$\frac{4\cancel{(x+1)}}{(x-1)\cancel{(x+1)}} > 0$$

$$\frac{\overset{+}{4}}{\underset{+}{x-1}} > 0$$

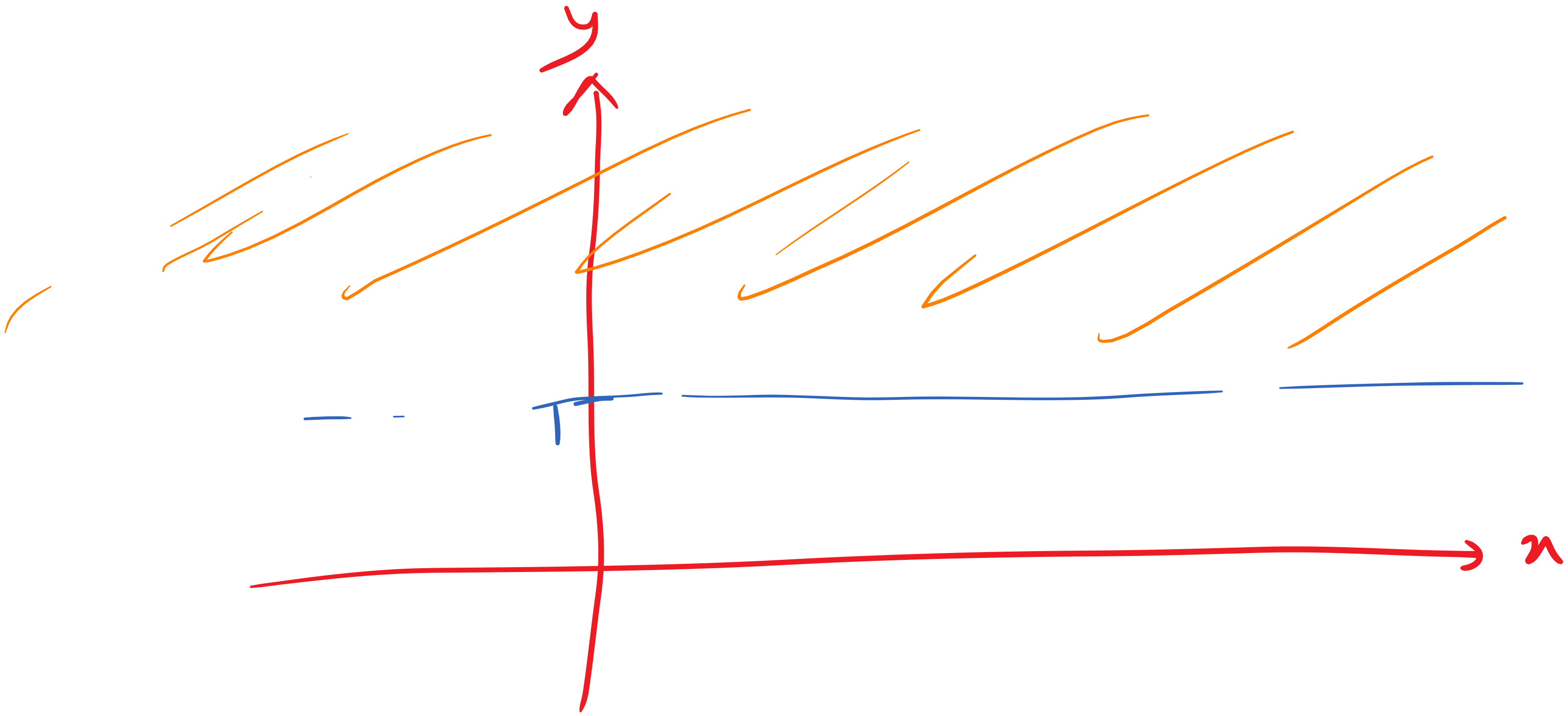
$$x-1 > 0 \longrightarrow x > 1$$

Which among the following functions has the graph fully contained in the halfplane $y > 1$ of the Cartesian plane?

>3

>0

- A. $y = 10^{-x} + 3$
- B. $y = |\log_{10} x|$
- C. $y = 2 + \log_{10} x$
- D. $y = x^2$
- E. $y = 10^x$



If the measure of an angle is 15°, its measure in radians is

A. $\frac{\pi}{18}$

B. $\frac{\pi}{12}$ ✓

C. $\frac{\pi}{10}$

D. $\frac{\pi}{24}$

E. $\frac{\pi}{2}$

$$D \times \frac{\pi}{180} \longrightarrow R$$

$$R \times \frac{180}{\pi} \longrightarrow D$$

$$15^\circ \times \frac{\pi}{180} = \frac{\pi}{12}$$

In the Cartesian plane, the straight line with equation

$$x + 2y + 2 = 0 \longrightarrow 2(y+1) = -x$$

$$y + 1 = -\frac{x}{2} \rightarrow \left| \begin{array}{l} y = -\frac{x}{2} - 1 \\ y = (x-1)^2 \end{array} \right.$$

and the parabola with equation

$$y = (x - 1)^2$$

have

$$(x-1)^2 = -\frac{x}{2} - 1$$

$$x^2 - 2x + 1 = -\frac{x}{2} - 1$$

$$x^2 - \frac{3}{2}x + 2 = 0$$

$$\Delta = \frac{9}{4} - 4 \times 2 = \frac{9}{8} - 8 < 0$$

- A. four distinct intersection points
- B. a unique intersection point
- C. three distinct intersection points
- D. no intersection point
- E. two distinct intersection points

The solution of the inequality

$$\log_{10} x > \log_{10}(x-1)$$

is

$x > x - 1$

$\log_{10} x > \log_{10}(x-1)$

$x > 0$ $\quad$ $x - 1 > 0$

$x > 1$

$\boxed{x > 1}$

- A. $0 < x < 1$
- B. $x > 1$ ✓
- C. $x > 0$
- D. every real value of x
- E. $x \geq 1$

The product of two positive real numbers x and y with $x < y$

$x < y$

$0.5 \quad 0.7$

$xy = 0.35$

$x < y$

$2 \quad 3$

$xy = 6$

- A. can be greater than y or less than x
- B. is always greater than y
- C. can be neither equal to x nor equal to y
- D. is always between x and y
- E. is always less that x

The set of solutions to the inequality

$$\log_{10}(\log_{10} x) < \frac{1}{2}$$

>0

$x>0$

$x>1$

is

- A. $x < 10$
- B. $1 < x < 10^{\sqrt{10}}$ ✓
- C. $x < 10^{\sqrt{10}}$
- D. every real value of x
- E. $1 < x < 10$

$\log_{10} x < \left(10^{\frac{1}{2}}\right)^{\sqrt{10}}$

$$\boxed{1 < x < 10^{\sqrt{10}}}$$

Only one of the following polynomials vanishes both for $x = -2$ and for $x = 2$. Which one?

- A. $P(x) = 2x^3 + x^2 - 8x - 4$ ✓
- B. $P(x) = 2x^3 + 3x^2 - 3x - 2$
- C. $P(x) = 2x^3 + x^2 - 2x - 1$
- D. $P(x) = 2x^3 - 5x^2 + x + 2$
- E. $P(x) = 2x^3 - x^2 - 5x - 2$

$x = 2$
$x = -2$

$P(2) = 0$
$P(-2) = 0$

مثلث قائم الزاوية   احد الاضلاع

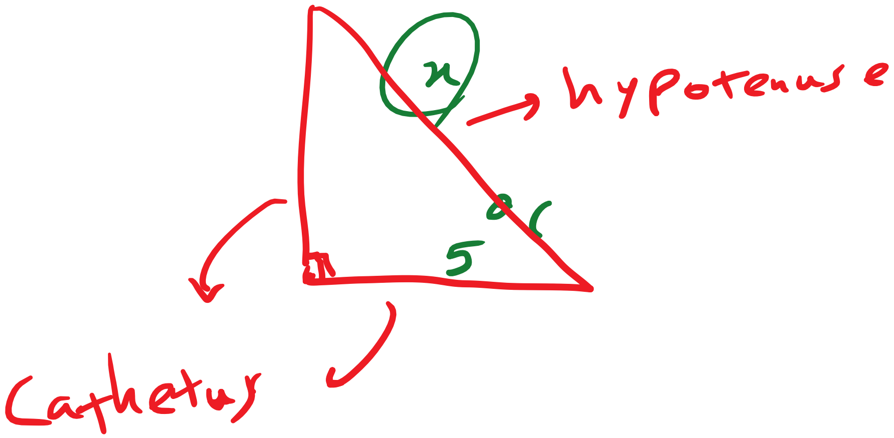
In a right-angled triangle a cathetus is 5 cm long, and the cosine of the adjacent angle is equal to 4/5.

مجاور

Determine the length of the hypotenuse (in cm)?

وتر

- A. 4
- B. 6,25 ✓
- C. 10
- D. 8,33
- E. 3



$$\cos\theta = \frac{5}{x} = \frac{4}{5} \longrightarrow x = \frac{25}{4} = 6.25$$

$(x-\alpha)^2+(y-\beta)^2=r^2$ معادله دایره:

مرکز $=(\alpha,\beta)$ شعاع $=r$

Let us consider, in the Cartesian plane, the family of circles with equation

$$x^2 + y^2 - 4x - 4y = K,$$

where K is a real parameter. Does there exist a circumference of the family which is tangent to both coordinated axes?

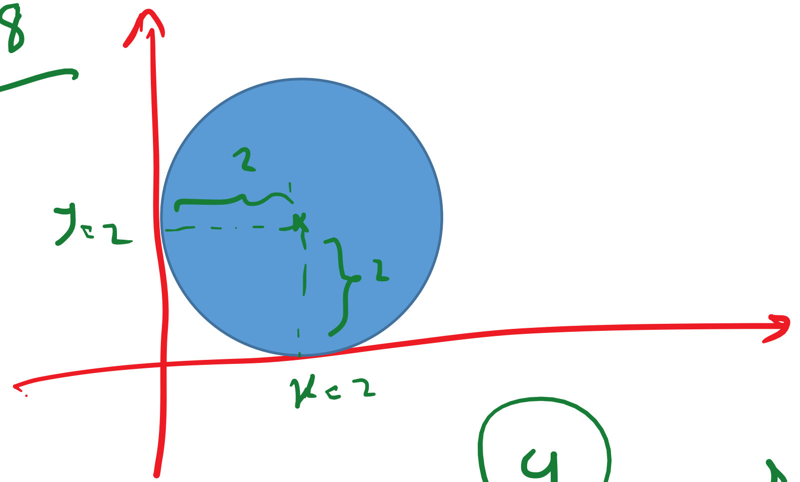
مماس

circle = دایره

$x^2-4x+4-4+y^2-4y+4-4=K$

$(x-2)^2+(y-2)^2=K+8$

- A. Yes, for $K = -4$ ✓
- B. Yes, for $K = 12$
- C. Yes, for $K = 4$
- D. No
- E. Yes, for $K = 0$



$(x-2)^2+(y-2)^2=2^2 \rightarrow 4 \rightarrow K+8=4$

$K=-4$

The set of real numbers x that satisfy the inequality

$$-x^2+7>0$$

is

$\sqrt{x^2} = |x|$

$x^2 < 7$

$|x| < \sqrt{7}$

$x^2 < a$

$|x| < \sqrt{a}$

A. $|x| < \sqrt{7}$

B. $|x| > \sqrt{7}$

C. $x < 0$

D. $x > \sqrt{7}$

E. $x < -\sqrt{7}$

$|x| < a \rightarrow -a < x < a$

$|x| > a \rightarrow x > a$ & $x < -a$

$x^2 < a \rightarrow -\sqrt{a} < x < \sqrt{a}$

$x^2 > a \rightarrow x > \sqrt{a}$ & $x < -\sqrt{a}$

Three times 27^3 is

- A. 81^3
- B. 3^7
- C. 3^9
- D. 27^4
- ✓ E. 3^{10}

$3 \times 27^3 = 3(3^3)^3 = 3(3^9) = 3^{10}$

Two integers x and y have different sign. Their sum is

- A. always zero
- B. negative if $|x| > |y|$ and $x > 0$
- C. always negative
- D. positive if $|x| > |y|$ and $x > 0$
- E. always positive

$x \quad y$

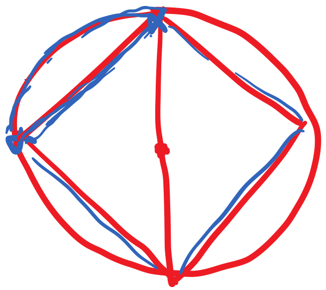
$3 \quad -2$

$\downarrow$

$x+y=1>0$

If the diagonal of a square and the diameter of a circle have the same length, then

- A. the square and the circle are equivalent
- B. the perimeter of the square is longer then the circumference, and the area of the square is greater than the area of the circle
- C. the perimeter of the square is shorter then the circumference, and the area of the square is less than the area of the circle
  دایره
- D. the perimeter of the square is longer then the circumference, and the area of the square is less than the area of the circle
- E. the perimeter of the square is shorter then the circumference, and the area of the square is bigger than the area of the circle



For every real number $a > 0$, the expression

$$\sqrt[3]{a \cdot \sqrt{a}} : \sqrt[4]{a^2 \cdot \sqrt[3]{a^2}}$$

is equal to

- A. $\sqrt[6]{\dfrac{1}{a}}$
- B. $\sqrt[6]{a}$
- C. a
- D. 1
- E. $\dfrac{1}{\sqrt[3]{a}}$

$$= \frac{\sqrt[3]{a^1 \cdot a^{\frac{1}{2}}}}{\sqrt[4]{a^2 \cdot a^{\frac{2}{3}}}} = \frac{\sqrt[3]{a^{\frac{3}{2}}}}{\sqrt[4]{a^{\frac{8}{3}}}} = \frac{a^{\frac{1}{2}}}{a^{\frac{2}{3}}} = a^{\frac{1}{2}} \times a^{-\frac{2}{3}}$$

$$= a^{\frac{1}{2}-\frac{2}{3}} = a^{\frac{3-4}{6}} = a^{-\frac{1}{6}} = \frac{1}{a^{\frac{1}{6}}} = \frac{1}{\sqrt[6]{a}} = \sqrt[6]{\frac{1}{a}}$$