

The circles in the figure have the same centre and $|MN| = |NP| = |PR| = |RS|$
 The yellow regions have same area and $m(\widehat{TMS}) = 8^\circ$

What is the measure of the angle \widehat{VMU} ?

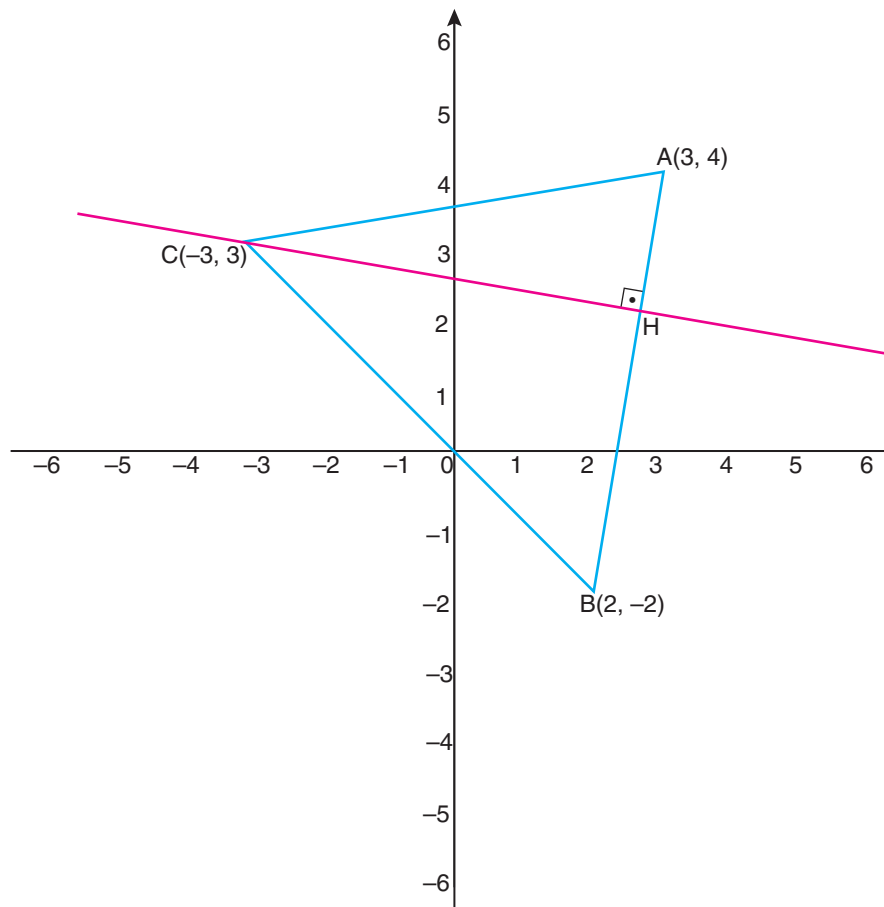
- A) 28° B) 35° C) 42° D) 49°

The operation " \clubsuit " on the set of complex numbers is defined as

$$z_1 \clubsuit z_2 = z_1 + z_2 + |z_1 \cdot z_2|$$

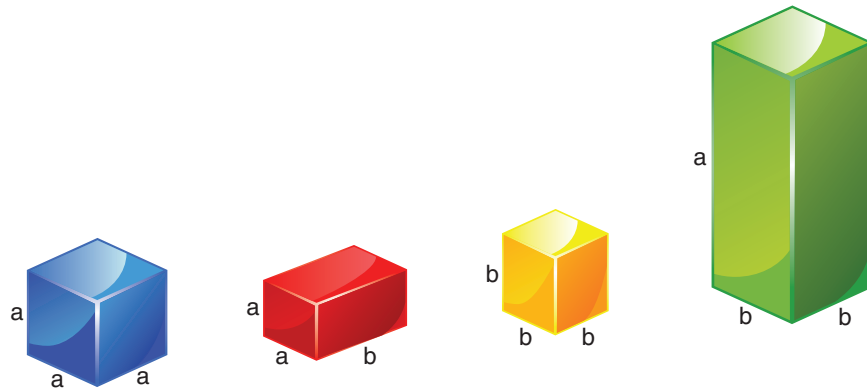
What is the equivalent of the operation $(1 - 2i) \clubsuit (2 + i)$

- A) $1 + 8i$
 B) $1 - 8i$
 C) $8 + i$
 D) $8 - i$



What is the equation for the line that passes through the height of the side [AB] of the triangle ABC?

- A) $x - y + 1 = 0$
- B) $6x + y - 10 = 0$
- C) $x + 6y - 15 = 0$
- D) $x + 6y - 10 = 0$



Which of the following statements about the prisms above are true?

- I. The sum of the volumes of the green and red prisms is $a \cdot b \cdot (a + b)$ units cube
- II. The sum of the volumes of the blue and brown prisms is $(a + b) \cdot (a^2 - a \cdot b + b^2)$ units cube
- III. The sum of the volumes of all the prisms is $(a + b) \cdot (a^2 + b^2)$ units cube

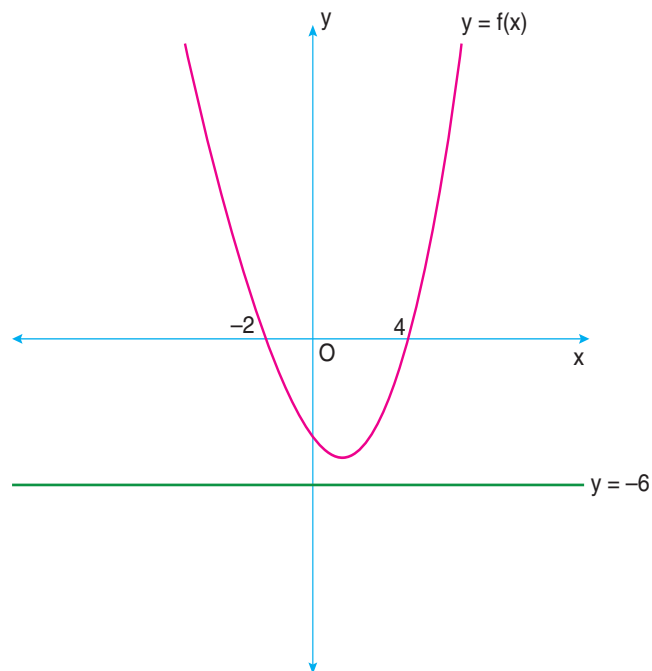
- A) I and II
- B) II and III
- C) I and III
- D) I, II and III



A bacteria population which consists of 30000 cells is constantly decreasing in number as it is being exposed to some kind of medication. The formula $P(t) = 30000 \cdot e^{-0.02 \cdot t}$ is used to calculate the number of remaining bacteria at the end of t^{th} day.

What's the number of the remaining bacteria at the end of 10th day? (the approximate value of $e^{0.2}$ is 1.2)?

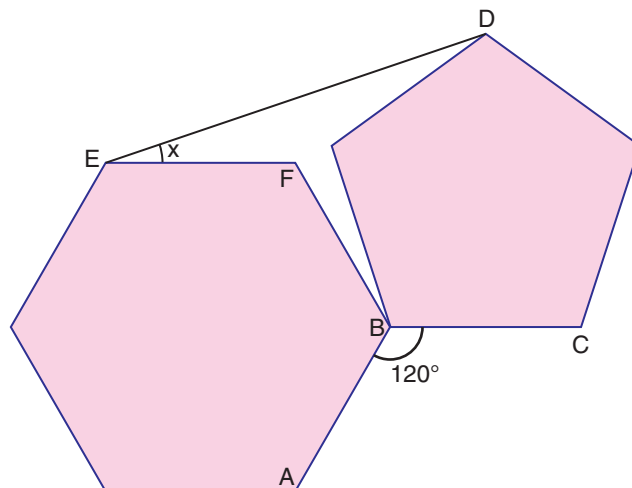
- A) 25000
- B) 24000
- C) 21000
- D) 20000



Above are the sketches of the parabola $y = f(x)$ and the line $y = -6$

Given so, which of the following propositions is absolutely false?

- A) $f(-3) \cdot f(-2) = 0$
- B) $f(2) \cdot f(3) < 36$
- C) $f(3) \cdot f(5) < 0$
- D) $f(1) + f(3) = -12$



Vertex B of the regular hexagon and the regular pentagon in the figure above are coincident. The length of the shorter diagonal of the hexagon is equal to the length of a diagonal of the pentagon.

Given that the measure of the angle ABC is 120° , what is the measure of the angle DEF?

- A) 21
- B) 22
- C) 23
- D) 24



$P(x)$ is a quadratic polynomial with leading coefficient 1.

Given that $P(-1) = 2$ and $P(2) = 0$

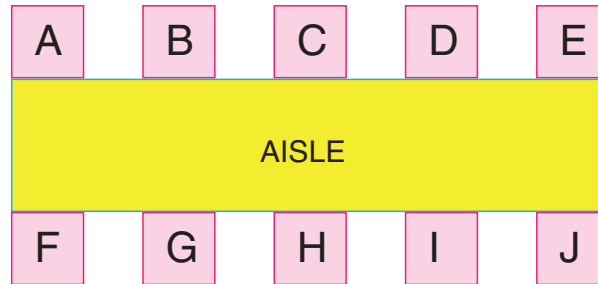
What's the remainder when the polynomial $P(x)$ is divided by $(x + 2)$?

A) $\frac{10}{3}$

B) $\frac{20}{3}$

C) $\frac{11}{4}$

D) $\frac{7}{3}$



Mary and Andy will take an exam in a school with 10 classrooms. There are five classrooms on each side of an aisle. Each classroom on one side faces another classroom on the opposite side.

Above is the map of the classrooms A, B, C, D, E, F, G, H, I and J.

Given the circumstances what is the probability that Mary and Andy take their exams in classrooms facing each other?

A) $\frac{2}{9}$

B) $\frac{1}{9}$

C) $\frac{1}{10}$

D) $\frac{1}{12}$

We have the following information about the ages of Alice and Sarah

Given that x and y are positive integers,

Sarah was $(x+2y)$ years old when Alice was born

In 2021, when Alice was x years old, Sarah was $(3x+y)$ years old.

In 2023 Sarah is 30 years old.

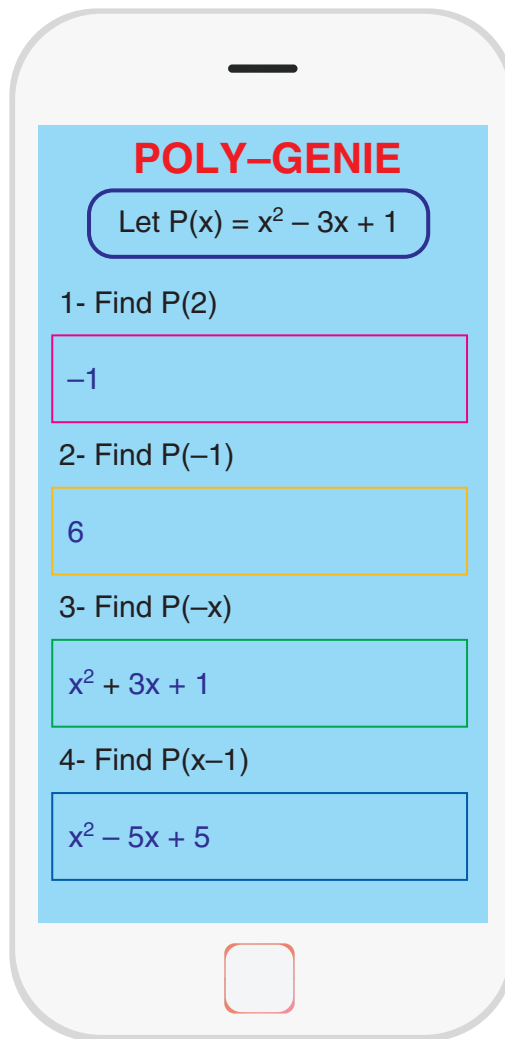
How old will Alice be in 2026?

A) 10

B) 12

C) 15

D) 18



Sergio, who has difficulty in solving quadratic polynomials, downloads an application on his mobile, but then he realizes that the application is not working properly. He decides to write a comment about the application.

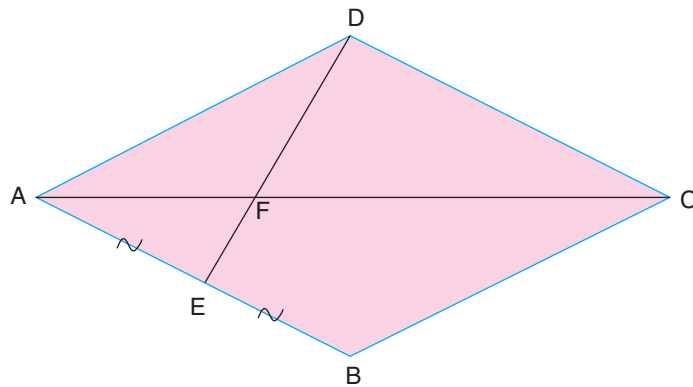
Looking at the solutions he got from the application, what percentage can he write for the problem solving reliability of the application?

A) 100%

B) 75%

C) 50%

D) 25%



ABCD is a rhombus and the line segments $[AC]$ and $[DE]$ intersect at point F.

Given that $|AE|=|EB|$, $|AF|=6$ cm and $|FE|=4$ cm,

What is the perimeter of the rhombus ABCD in centimeters?

- A) $8\sqrt{34}$ B) $8\sqrt{35}$ C) 48 D) $8\sqrt{37}$

What is the solution set for the following equation $-4 = 2 - \sqrt{x^2 - 4x + 15}$

- A) $\{-3\}$ B) $\{-3, 7\}$ C) $\{7\}$ D) \emptyset

What is the solution set for the following equation $\frac{-2}{x-3} = \frac{x}{x-6}$

- A) $\{-3\}$ B) $\{-3, 4\}$ C) $\{4\}$ D) $\{\}$

The function $f : \mathbb{Z} \rightarrow \mathbb{Z}$ is defined as $f(x) = \begin{cases} \frac{x+1}{2}, & \text{if } x \text{ is odd} \\ 3x-4, & \text{if } x \text{ is even} \end{cases}$

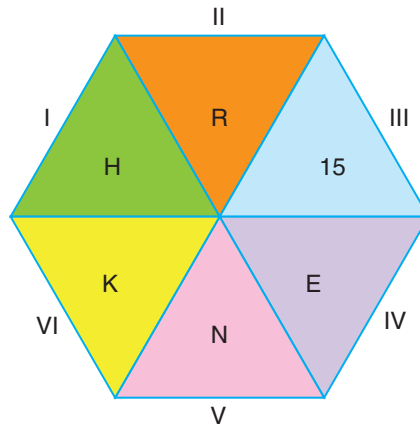
Given the circumstances, what is the sum of the values of a where $f(7) - f(a) = 2$

- A) 2 B) 3 C) 4 D) 5

f and g are functions defined in real numbers where $f(x) = 2x + a$ and $g(x) = ax - 3$

Given so, what is the sum of the squares of the values of "a" which satisfies $(f \circ g)(x) = (g \circ f)(x) - 5$

- A) 4 B) 5 C) 6 D) 8



The regular hexagon in the figure above consists of six equilateral triangles with numbers written inside.

Starting from I and going clockwise the numbers H, R, 15, E, N, K form an arithmetic sequence of six terms.

Starting from VI and going counter clockwise the numbers K, N, E, 15, R, H form a geometric sequence of six terms.

What's the sum $(H + R + E + N + K)$?

- A) 30 B) 45 C) 60 D) 75

The real number sequence a_n satisfies the condition $\frac{a_n}{n} = (-1)^n \cdot a_{n+1}$ for every positive integer n

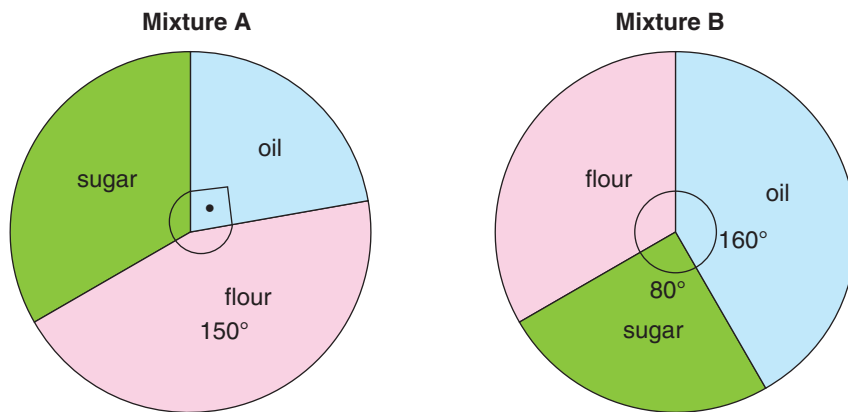
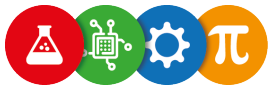
Given $(a_2) = 2$ what's the positive value of k which satisfies the condition

$$\frac{a_1 \cdot a_2 \cdot a_3}{a_4 \cdot a_5} = -k^2?$$

- A) 4 B) 6 C) 9 D) 12

What is the positive value of the difference between the arithmetic mean and geometric mean of the numbers 8, 27 and 64?

- A) 33 B) 24 C) 9 D) 12



Chef Danilo has prepared two different mixtures A and B for a special cake. The ratios of the ingredients in the mixtures are given in the figure.

The weight of the mixture A is twice the weight of the mixture B.

The chef puts the two mixtures together in a large bowl and stirs them.

What is the ratio of sugar in the resultant mixture ?

- A) $\frac{1}{2}$ B) $\frac{5}{9}$ C) $\frac{3}{4}$ D) $\frac{8}{27}$

Given the system of equations

$$\left. \begin{aligned} x^2y + xy^2 + x + y &= 144 \\ x \cdot y &= 8 \end{aligned} \right\}$$

where x and y are real numbers,

What's the equivalent of $x^2 + y^2$?

- A) 200 B) 215 C) 240 D) 270



Above is the instant image of three hot air balloons. Balloon A is the nearest to the ground and B is the furthest. The top parts of balloons A and B are $5\sqrt{5}$ m and $\sqrt{150}$ m above the ground respectively.

Which of the following altitudes may belong to the top part of balloon C ?

I. $3\sqrt{15}$ m

II. 12 m

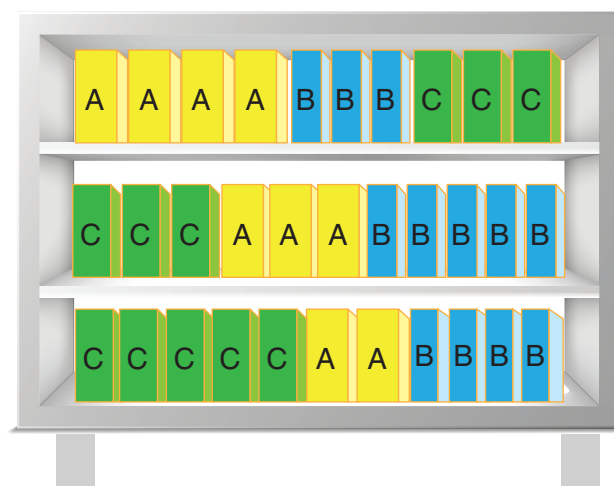
III. $7\sqrt{3}$ m

A) II and III

B) Only III

C) I and III

D) I, II and III



The three shelves of the bookcase above have the same width in centimetres. The books of the same colour have the same thickness. Each thickness is an integer number. There is no space on the shelves when the books are placed as in the picture.

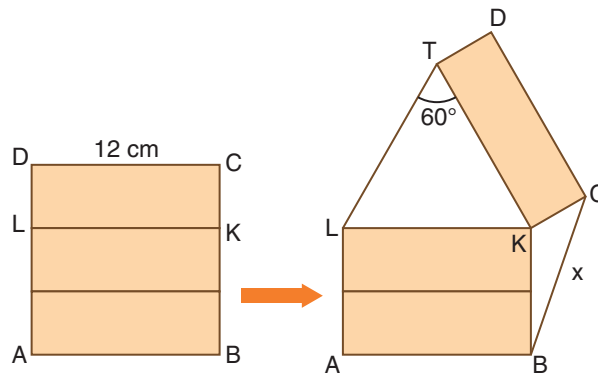
What is the minimum width for the shelves?

A) 31 cm

B) 45 cm

C) 56 cm

D) 60 cm

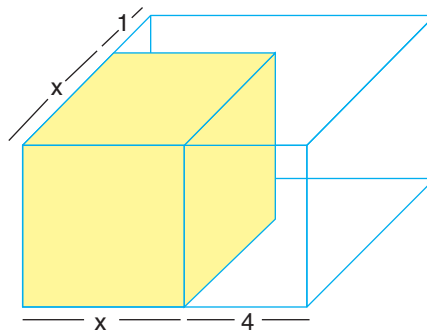


A piece of paper in the shape of the rectangle ABCD has side lengths as 12 cm and 9 cm. This paper is divided into three congruent rectangles by cutting through two lines which are parallel to its longer side.

The piece on the top is rotated around the point K, so that it forms the angle KTL which is 60° .

Given the circumstances, what is the length of the line segment [BC] in the figure on the right?

- A) $2\sqrt{15}$ B) $3\sqrt{7}$
C) 8 D) $6\sqrt{2}$



A cube with an edge of x cm is placed in a transparent rectangular right prism as shown in the figure above.

Given that the volume of the empty area in the prism is 57 cube units, what is the value of x in cube units?

- A) 2 B) 2.5 C) 3 D) 3.5