SAT Math Level 1

(1) The value of sin x increases faster than tan x as x increases (x < 90°).

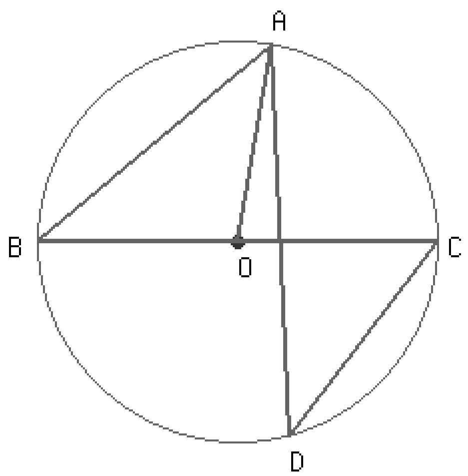
- True
- False

(2) What is the value of | a + 19 |, if a is less than -19 ?

(3) Find the value of the following

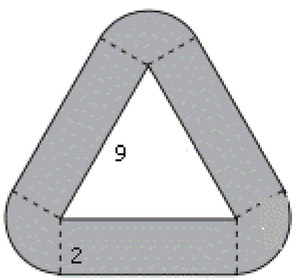
$(-9)^{-3}$

(4) If BC is a diameter of the circle and ∠BAO = 40°. Then, the value of ∠ADC is ____ °.



(5) A rectangular playground has length and width in the ratio 9:40. If the area of the playground is 360 sq. m., then the length of a diagonal path through the playground is ____ metres

(6) An equilateral triangle has side length 9 cm. What is the area of a region of all the points outside the equilateral triangle that are within 2 cm of the triangle?



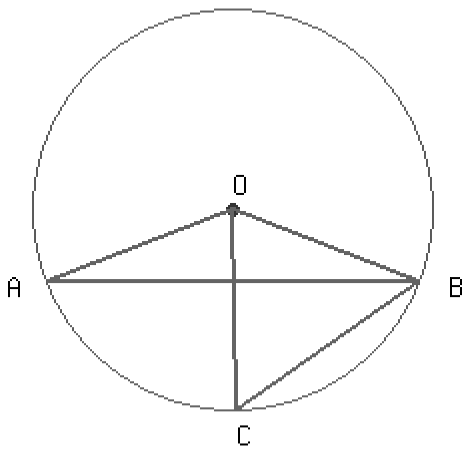
a. $cm^2 66 + 4\pi$ **b.** $54 + 4\pi$ cm^2

c. $36 - 2\pi$ cm^2 **d.** $51 - 6\pi$ cm^2

(7) The absolute value of an integer is less than the integer .

- True
- False

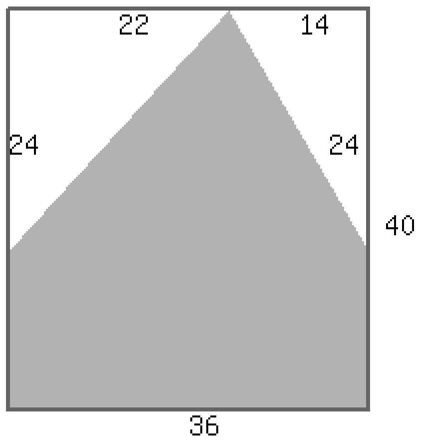
(8) If ∠OAB = 21° and ∠OCB = 56°, find ∠BOC.



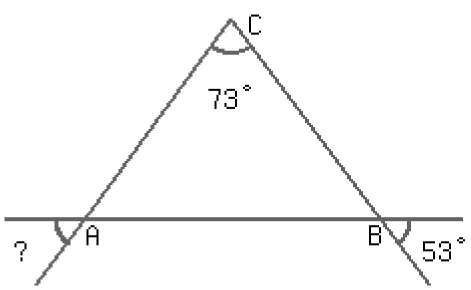
a. 68° **b.** 73°

c. 78° **d.** 58°

(9) Find area of shaded region (All measurements are in cm).



(10) Find the value of the missing angle.



a. 54° **b.** 59°

c. 44° **d.** 49°

(11) If $x + 3y = 6$ then which of the following values of x and y will hold true?

a. $x = 6, y = \frac{5}{3}$

b. $x = 2, y = \frac{4}{4}$

c. $x = 2, y = \frac{4}{3}$

d. $x = \frac{4}{4}, y = \frac{5}{3}$

(12) What must be subtracted from $-2y^2 + 3y + 5$ to get $y^2 - 3y + 2$?

a. $-3y^2 + 6y + 3$

b. $-3y^2 + 6y - 3$

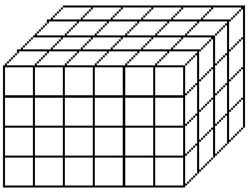
c. $-3y^2 - 6y + 3$

d. $3y^2 + 6y + 3$

(13) Solve the following:

$$37 + 8 \times 2 - 14 + 5 \div 2 = \underline{\quad}\ \frac{\underline{\quad}}{\underline{\quad}}$$

(14) Following shape is made of several small cubes. What fraction of cubes are visible in the picture shown below?



a. $\frac{51}{96}$

b. $\frac{45}{96}$

c. $\frac{82}{96}$

d. $\frac{64}{96}$

(15) $1^4 \times 5^2 = ?$

a. 25

b. 24

c. 20

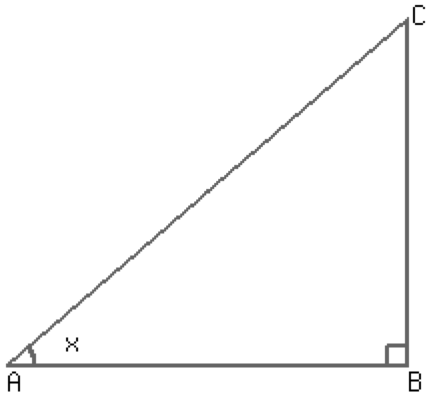
d. 19

Answers

(1) False

Step 1

Let's observe this right angle triangle.

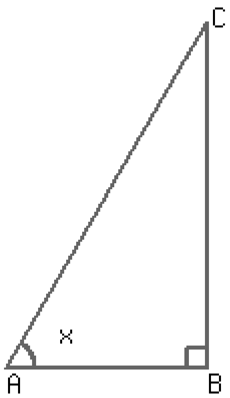


$$\sin x = \frac{BC}{AC}$$

$$\tan x = \frac{BC}{AB}$$

Step 2

Now, let's increase the angle x such that height BC remains unchanged.



Step 3

By comparing above two pictures, we can notice that decrease in AB is larger than decrease in AC.

Step 4

Now, numerator of both the fractions are unchanged, but denominator of tan x is decreasing faster than denominator of sin x.
Therefore, tan x increases faster than sin x, as x increases.

Step 5

Hence, given statement is **False**.

(2) -(a + 19)

Step 1

$|a + 19| = a + 19$ if, $a + 19 >= 0$,
$|a + 19| = -(a + 19)$ if, $a + 19 < 0$

Step 2

We can write the above expression as,
$|a + 19| = a + 19$ if, $a >= -19$,
$|a + 19| = -(a + 19)$ if, $a < -19$

Step 3

Since it is given that *a is less than -19,*
$|a + 19|$ = $\mathbf{-(a + 19)}$

(3) $\frac{-1}{729}$

Step 1

We have been asked to find the value of $(-9)^{-3}$.

Step 2

Now,

$(-9)^{-3} = \frac{1}{(-9)^3}$

$= \frac{1}{(-9) \times (-9) \times (-9)}$

$= \frac{-1}{729}$

Step 3

Therefore, the value of $(-9)^{-3}$ is $\frac{-1}{729}$ **.**

(4) 40

Step 1

As,OA and OB are the radius of the circle, OA = OB. This means ΔAOB is an isosceles triangle. So,
∠ABO = ∠BAO = 40°.

Step 2

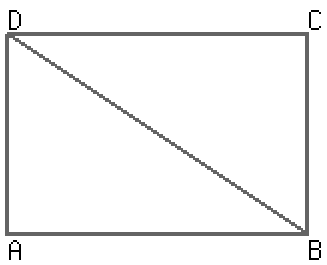
Also, ∠ABO = ∠ABC
Considering the chord AC, ∠ABC and ∠ADC are the angles subtended by the chord AC in the same segment of the circle.
We know that the angle subtended by a chord in the same segment of a circle are equal. So,
∠ABC = ∠ADC

Step 3

Therefore, ∠ADC = ∠ABC = 40°.

(5) 41

Step 1



Rectangular Playground

Let us assume that ABCD is the rectangular playground. AB, BC, and BD are the length, width, and diagonal of the rectangle, respectively.

Step 2

Let us assume that x is the common factor of the length and the width of the rectangular playground.
According to the question, the length and the width of the rectangular playground are in the ratio 9:40.
Length of the playground = $9x$
Width of the playground = $40x$
Area of the playground = $9x \times 40x = 360x^2$

Step 3

According to the question, the area of the playground is 360 sq. m.
Therefore, $360x^2 = 360$

$\Rightarrow x^2 = \dfrac{360}{360}$

$\Rightarrow x^2 = 1$

$\Rightarrow x^2 = (1)^2$

$\Rightarrow x = 1$

Step 4

Length of the playground = $9x = 9 \times 1 = 9$ m
Width of the playground = $40x = 40 \times 1 = 40$ m

Now, in the rectangle ABCD, $BD^2 = AB^2 + BC^2$

$\Rightarrow BD^2 = 9^2 + 40^2$

$\Rightarrow BD^2 = 81 + 1600$

$\Rightarrow BD^2 = 1681$

$\Rightarrow BD^2 = (41)^2$

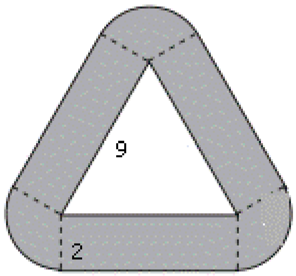
$\Rightarrow BD = 41$

Step 5

Thus, the length of the diagonal path through the playground is **41 m**.

(6) **b.** $54 + 4\pi\ cm^2$

Step 1



If we look at the figure, we notice that the area of the region of all the points outside the equilateral triangle = 3(The area of the rectangle + The area of the sector of the circle)

Step 2

The area of the rectangle = $9 \times 2 = 18\ cm^2$

Step 3

Let's assume the angle and the radius of the sector of the circle be 'θ' and 'r' respectively.

Step 4

We know that, each angle of an equilateral triangle and rectangle are 60° and 90° respectively.
Therefore, $\theta = 360° - (90° + 90° + 60°) = 120°$,
$r = 2$ cm

The area of the sector of the circle = $\frac{\theta}{360} \times \pi r^2$

$= \frac{120}{360} \times \pi(2)^2$

$= \frac{4\pi}{3}\ cm^2$

Step 5

Now, the area of the region of all the points outside the equilateral triangle within 2 cm = $3(18 + \frac{4\pi}{3}) = 54 + 4\pi\ cm^2$

(7) False

Step 1

We know that the 'Absolute Value' is the value of the number itself without any regards to the mathematical sign placed before it. Therefore, this value is always a positive number.

- For positive numbers, the absolute value is same as the number itself. e.g. |5| = 5.
- For negative numbers, the absolute value is reverse of the number. e.g. |-5| = 5.

Step 2

We can see that the absolute value of a number is either *equal* to the number (for positive numbers), or is *larger* than the number (for negative numbers).
Hence the given statement *"The absolute value of an integer is less than the integer"* is **false**.

(8) **a.** 68°

In ΔOCB, we see that OC = OB (radius of a circle).
⇒ ∠OCB = ∠OBC (angle opposite to equal sides are equal)
Also, ∠BOC + ∠OCB + ∠OBC = 180° (angle sum property)
So, ∠BOC = 180° - (∠OCB + ∠OBC).
⇒ ∠BOC = 180° - 2 × 56° = 68°

(9) 1008 cm^2

Step 1

The area of the shaded region = The area of the rectangle - The area of the unshaded right angled triangles

Step 2

Area of the rectangle = 36 × 40 = 1440 cm^2

Step 3

Area of a right angled triangle = $\frac{1}{2}$ (Base × Height)

Therefore, the area of the unshaded right angled triangles = $\frac{1}{2}$ (22 × 24) + $\frac{1}{2}$ (14 × 24)

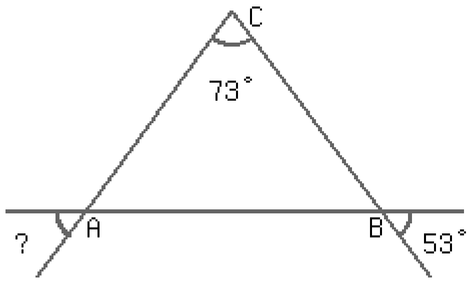
= (264 + 168) cm^2

Step 4

Hence, the area of shaded region is: 1440 - (264 + 168) = 1008 cm^2

(10) a. 54°

Step 1



In the triangle ABC,
∠B = 53° *...(Vertically opposite angles)*

Step 2

Now, in triangle ABC, ∠A + ∠53° + 73° = 180° *...(Sum of all the angles of a triangle is equal to 180°)*
⇒ ∠A = 54°

Step 3

The missing angle = ∠A = 54° *...(Vertically opposite angles)*

Step 4

Therefore, the value of the missing angle is **54°**.

(11) c. $x = 2,\ y = \dfrac{4}{3}$

Step 1

Here, we are given an equation with 2 variables, i.e., $x + 3y = 6$.
It is not possible to find the value of x and y from the given equation, as we require 2 equations to find the value of 2 variables.

Step 2

However, we can substitute the values of x and y given in the options to check the correctness of the equations. Among the given options, we can see that only $x = 2,\ y = \dfrac{4}{3}$ satisfies the equation.

$x + 3y = 6$

$\Rightarrow 2 + 3 \times \dfrac{4}{3} = 6$

$\Rightarrow 6 = 6$

Step 3

Hence, option **c** is the correct answer.

(12) **a.** $-3y^2 + 6y + 3$

Step 1

If we subtract $y^2 - 3y + 2$ from $-2y^2 + 3y + 5$, we can find out the polynomial that must be subtracted from $-2y^2 + 3y + 5$ to get $y^2 - 3y + 2$.

Step 2

To subtract the polynomial $y^2 - 3y + 2$ from $-2y^2 + 3y + 5$, first reverse the sign (turn '+' into '-' and '-' into '+') of each term of the polynomial $y^2 - 3y + 2$, as following:
$-(y^2 - 3y + 2) = -y^2 + 3y - 2$

Step 3

Now, we can add the like terms of two polynomials, as shown below.

$$\begin{array}{rrr} -2y^2 & +3y & +5 \\ -y^2 & +3y & -2 \\ \hline -3y^2 & +6y & +3 \\ \hline \end{array}$$

.

Step 4

Therefore, $\mathbf{-3y^2 + 6y + 3}$ must be subtracted from $-2y^2 + 3y + 5$ to get $y^2 - 3y + 2$.

Step 5

Hence, option **a** is the correct answer.

(13) $37 + 8 \times 2 - 14 + 5 \div 2 = 41\frac{1}{2}$

(14) a. $\frac{51}{96}$

Step 1

Let us first count the number of cubes along the length, breadth and the height.

Step 2

Along the length, there are 6 cubes, along the breadth there are 4 cubes, and along the height there are 4 cubes.

Step 3

The total number of cubes in the given box will be $6 \times 4 \times 4 = 96$.

Step 4

Counting the number of cubes. We get,
Number of cubes visible in the given picture is equal to 51.

Step 5

The fraction of the cubes visible will be equal to $\frac{51}{96}$.

(15) a. 25

Step 1

$1^4 \times 5^2$ can be written as:

$1^4 \times 5^2 = (1 \times 1 \times 1 \times 1) \times (5 \times 5)$

$= (1) \times (25)$

$= 25$

Step 2

Hence, option **a** is the correct answer.