

### MATEMÁTICA

01) Resposta: D

#### Resolução

Pela figura percebemos que a soma de todos os trechos verticais é igual a 12 m. De forma análoga, a soma dos trechos horizontais é 16 m. Logo, a distância percorrida é de  $12\text{ m} + 16\text{ m} = 28\text{ m}$ .

02) Resposta: D

#### Resolução

$$\begin{array}{r}
 f(x) = 6x^4 - x^3 - 9x^2 - 3x + 7 \quad \left| \begin{array}{l} 2x^2 + x + 1 = g(x) \\ 3x^2 - 2x - 5 = q(x) \end{array} \right. \\
 \underline{-6x^4 - 3x^3 - 3x^2} \\
 -4x^3 - 12x^2 - 3x \\
 \underline{4x^3 + 2x^2 + 2x} \\
 -10x^2 - x + 7 \\
 \underline{+10x^2 + 5x + 5} \\
 r(x) = 4x + 12
 \end{array}$$

$$r(x) = 0 \Rightarrow 4x + 12 = 0 \Rightarrow x = -3$$

$$q(x) = 0 \Rightarrow 3x^2 - 2x - 5 = 0 \Rightarrow x = -1 \text{ ou } x = \frac{5}{3}$$

$$\text{Produto das raízes} = (-3) \cdot (-1) \cdot \left(\frac{5}{3}\right) = 5$$

03) Resposta: E

#### Resolução

$$\left| \frac{60 \cdot \text{hora} - 11 \cdot \text{minutos}}{2} \right|$$

$$\left| \frac{60 \cdot 3 - 11 \cdot 20}{2} \right|$$

$$|90 - 110|$$

$$20^\circ$$

$$180^\circ \text{ _____ } \pi \text{ rad}$$

$$20^\circ \text{ _____ } \alpha$$

$$180^\circ \cdot \alpha = 20^\circ \cdot \pi$$

$$\alpha = \frac{\pi}{9}$$

04) Resposta: A

#### Resolução

$$\begin{array}{r}
 \text{mmc } (4, 5, 6) \left| \begin{array}{l} 2 \\ 2 \\ 3 \\ 3 \\ 5 \\ 5 \end{array} \right. \\
 2, 5, 3 \left| \begin{array}{l} 2 \\ 3 \\ 3 \\ 5 \\ 5 \end{array} \right. \\
 1, 5, 3 \left| \begin{array}{l} 3 \\ 5 \\ 5 \end{array} \right. \\
 1, 5, 1 \left| \begin{array}{l} 5 \\ 5 \end{array} \right. \\
 1, 5, 1 \left| \begin{array}{l} 5 \\ 5 \end{array} \right.
 \end{array}$$

Os remédios são tomados simultaneamente a cada 60 horas.

$$\frac{30^1 \cdot 24^{12}}{60^8} = 12 \text{ vezes}$$

05) Resposta: A

#### Resolução

$$3^{4x-1} + 9^x = 6$$

$$\frac{3^{4x}}{3^1} + 3^{2x} = 6$$

$$3^{2x} = y$$

$$\frac{y^2}{3} + y = 6$$

$$y^2 + 3y - 18 = 0$$

$$y = 3 \text{ ou } y = -6$$

$$3^{2x} = 3 \text{ ou } 3^{2x} = -6$$

$$2x = 1 \quad (\text{sem solução})$$

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

$$S = \left\{ \frac{1}{2} \right\}$$

Valor de  $x^*$ :

$$\left(\frac{1}{2}\right)^{\frac{1}{2}} = \sqrt{\frac{1}{2}} = \frac{\sqrt{2}}{2}$$

06) Resposta: D

**Resolução**

Vamos considerar  $U = \mathbb{N}$

$$\frac{-3 \cdot x! + (x+1)!}{(x-1)!} \geq 3$$

Condições de existência:

$$C_1 = \{x \geq 0\}$$

$$C_2 = \{x+1 \geq 0\} \Rightarrow \{x \geq -1\}$$

$$C_3 = \{x-1 \geq 0\} \Rightarrow \{x \geq 1\}$$

$$C = C_1 \cap C_2 \cap C_3 = \{x \geq 1\}$$

$$\frac{-3 \cdot x \cdot (x-1)! + (x+1) \cdot x \cdot (x-1)!}{(x-1)!} \geq 3$$

$$-3 \cdot x + (x+1) \cdot x \geq 3$$

$$x^2 - 2x - 3 \geq 0$$

$$S_1 = \{x \leq -1 \text{ ou } x \geq 3\}$$

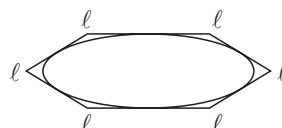
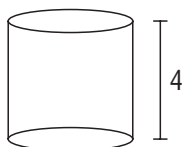
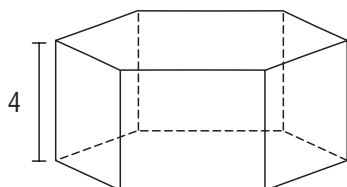
Solução final

$$S = C \cap S_1$$

$$S = \{x \in \mathbb{N} / x \geq 3\}$$

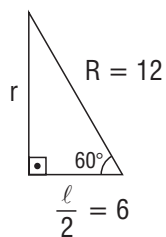
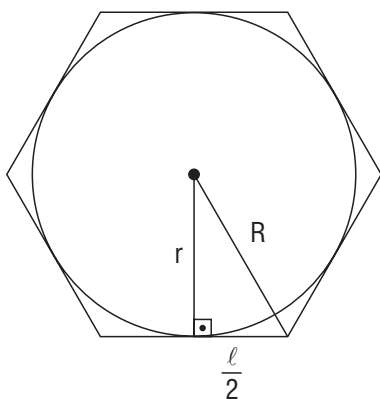
07) Resposta: E

**Resolução**



$$6l = 72$$

$$l = 12$$



$$\text{sen } 60^\circ = \frac{r}{12}$$

$$\frac{\sqrt{3}}{2} = \frac{r}{12}$$

$$r = 6\sqrt{3}$$

$$V = \pi \cdot r^2 \cdot h$$

$$V = \pi \cdot (6\sqrt{3})^2 \cdot 4$$

$$V = \pi \cdot 36 \cdot 3 \cdot 4$$

$$V = 432\pi \text{ cm}^3$$

08) Resposta: C

**Resolução**

$$f(x) = \frac{2x + 18}{x + 1}$$

$$g(x) = \sqrt[3]{x + 1}$$

Inversa de g(x):

$$x = \sqrt[3]{y + 1} \Rightarrow y = x^3 - 1 \Rightarrow g^{-1}(x) = x^3 - 1$$

Inequação:  $f(g^{-1}(x)) \leq 1 + [g(x)]^3$

$$\frac{2 \cdot (x^3 - 1) + 18}{(x^3 - 1) + 1} \leq 1 + (\sqrt[3]{x + 1})^3$$

$$\frac{2x^3 + 16}{x^3} \leq (x + 2)$$

$$\frac{2x^3 + 16}{x^3} - (x + 2) \leq 0$$

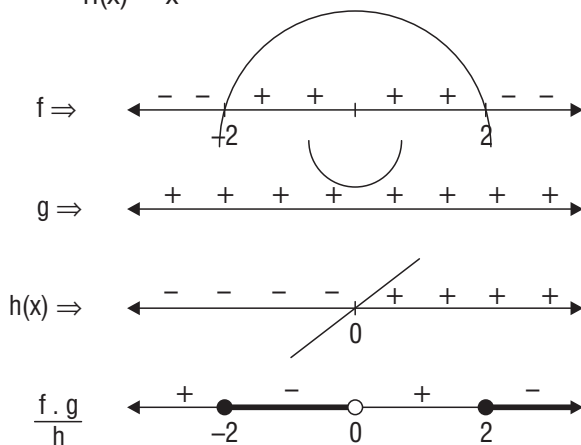
$$\frac{2x^3 + 16 - x^4 - 2x^3}{x^3} \leq 0$$

$$\frac{16 - x^4}{x^3} \leq 0 \quad (x_2)$$

$$\frac{16 - x^4}{x} \leq 0$$

$$\frac{(4 - x^2) \cdot (4 + x^2)}{x} \leq 0$$

Seja:  $f(x) = 4 - x^2$   
 $g(x) = 4 + x^2$   
 $h(x) = x$



$$S = \{x \in \mathbb{R} / -2 \leq x < 0 \text{ ou } x \geq 2\}$$

09) Resposta: A

**Resolução**

$$\begin{cases} c + g + p = 38 \\ 4c + 4g + 2p = 112 \\ \frac{p}{2} + c = g + 2 \end{cases}$$

$$- \begin{cases} c + g + p = 38 \\ 2c + 2g + p = 56 \\ 2c - 2g + p = 4 \end{cases}$$

$$\begin{cases} -c - g = -18 \\ 4g = 52 \\ g = 13 \end{cases}$$

$$\begin{aligned} -c - 13 &= -18 \\ -c &= -18 + 13 \\ c &= 5 \end{aligned}$$

$$c + g + p = 38 \rightarrow 5 + 13 + p = 38 \rightarrow p = 20$$

$$5 \cdot 500 + 13 \cdot 90 + 20 \cdot 55 = 4770$$

10) Resposta: C

**Resolução**

$$* \operatorname{tg}(2x) = \frac{2\operatorname{tg} x}{1 - \operatorname{tg}^2 x} \quad * \operatorname{sen}(2x) = 2 \cdot \operatorname{sen} x \cdot \operatorname{cos} x$$

$$\begin{aligned} & \operatorname{cotg}(2x) + \operatorname{cossec}(2x) \\ &= \frac{1 - \operatorname{tg}^2 x}{2\operatorname{tg} x} + \frac{1}{2 \cdot \operatorname{sen} x \cdot \operatorname{cos} x} \\ &= \frac{1 - \frac{\operatorname{sen}^2 x}{\operatorname{cos}^2 x}}{2 \cdot \frac{\operatorname{sen} x}{\operatorname{cos} x}} + \frac{1}{2 \cdot \operatorname{sen} x \cdot \operatorname{cos} x} \\ &= \frac{\operatorname{cos}^2 x - \operatorname{sen}^2 x}{\operatorname{cos}^2 x} \cdot \frac{\operatorname{cos} x}{2 \cdot \operatorname{sen} x} + \frac{1}{2 \cdot \operatorname{sen} x \cdot \operatorname{cos} x} \\ &= \frac{\operatorname{cos}^2 x - \operatorname{sen}^2 x}{2 \cdot \operatorname{sen} x \cdot \operatorname{cos} x} + \frac{1}{2 \cdot \operatorname{sen} x \cdot \operatorname{cos} x} \\ &= \frac{\operatorname{cos}^2 x + 1 - \operatorname{sen}^2 x}{2 \cdot \operatorname{sen} x \cdot \operatorname{cos} x} * (1 - \operatorname{sen}^2 x = \operatorname{cos}^2 x) \\ &= \frac{2 \operatorname{cos}^2 x}{2 \cdot \operatorname{sen} x \cdot \operatorname{cos} x} \\ &= \frac{\operatorname{cos} x}{\operatorname{sen} x} = \operatorname{cotg} x \end{aligned}$$

11) Resposta: D

**Resolução**

AGRUPAMENTOS SEM ELEMENTOS MÚLTIPLOS	NÚMERO DE MATRIZES POSSÍVEIS
(2, 3, 5, 7)	$P_4 = 4! = 24$
(3, 4, 5, 7)	$P_4 = 4! = 24$
(4, 5, 6, 7)	$P_4 = 4! = 24$
TOTAL:	72 matrizes

12) Resposta: A

**Resolução**

$$S_n = 93n - 4n^2$$

$$S_1 = 93 - 4 \Rightarrow a_1 = 89$$

$$S_2 = 93 \cdot 2 - 4 \cdot 2^2 \Rightarrow a_1 + a_2 = 170$$

$$S_3 = 93 \cdot 3 - 4 \cdot 3^2 \Rightarrow a_1 + a_2 + a_3 = 243$$

Portanto, a P.A. é:

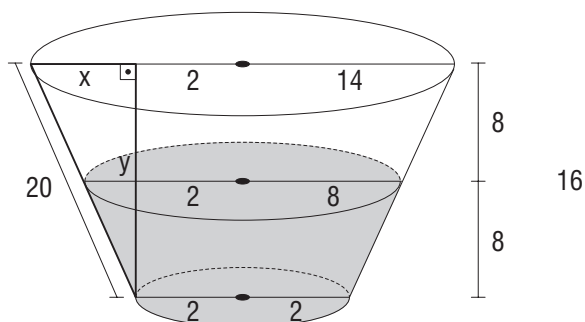
$$(89, 81, 73, \dots, a_n)$$

$$r = a_2 - a_1 = 81 - 89 = -8$$

$$a_3 = 73$$

13) Resposta: C

**Resolução**



$$(20)^2 = (16)^2 + x^2$$

$$400 = 256 + x^2$$

$$x = 12$$

$$\frac{x}{y} = \frac{16}{8}$$

$$\frac{12}{y} = 2$$

$$y = 6$$

$$V = \frac{h'}{3} \cdot [AB + Ab + \sqrt{AB \cdot Ab}]$$

$$V = \frac{8}{3} \cdot [\pi \cdot 8^2 + \pi \cdot 2^2 + \sqrt{\pi \cdot 8^2 \cdot \pi \cdot 2^2}]$$

$$V = \frac{8}{3} \cdot [64 \cdot \pi + 4 \cdot \pi + 8 \cdot 2 \cdot \pi]$$

$$V = 224 \cdot \pi \text{ cm}^3 \text{ (água)}$$

$$V = \frac{8}{3} \cdot [\pi \cdot 14^2 + \pi \cdot 8^2 + \sqrt{\pi \cdot 14^2 \cdot \pi \cdot 8^2}]$$

$$V = \frac{8}{3} \cdot [196 \cdot \pi + 64 \cdot \pi + 14 \cdot 8 \cdot \pi]$$

$$V = \frac{8}{3} \cdot [372 \cdot \pi]$$

$$V = 992 \cdot \pi \text{ cm}^3 \text{ (falta)}$$

I. Falsa.

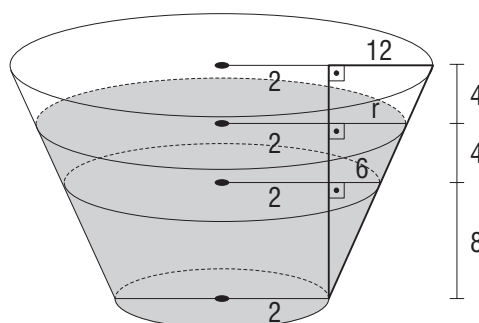
$$\frac{224\pi}{992\pi} = 0,225$$

II. Verdadeira.

$$28 \text{ cm}^3 \frac{1 \text{ s}}{224 \pi} = x$$

$$x \approx 25,12$$

III. Verdadeira.



$$\frac{r}{6} = \frac{12}{8} \quad r = 9$$

$$V = \frac{4}{3} \cdot [121\pi + 64\pi + 88\pi]$$

$$V = \frac{4}{3} \cdot [273\pi]$$

$$V = 364\pi \text{ cm}^3$$

14) Resposta: B

#### Resolução

Seja U o conjunto universo.

Temos:  $n(U) = 7$ ,  $n(A) = 3$ ,  $n(B) = 5$ ,  $n(C) = 7$

$A \subset U$ ,  $B \subset U$ ,  $C \subset U$

a) **Incorreto.** Se  $A \subset B \subset C$ , então  $n(A \cap B \cap C) = 3$ .

b) **Correto.** Não há possibilidade de  $A \cap B \cap C = \emptyset$ .

c) **Incorreto.** Se  $B \subset C$ , então  $n(B \cap C) = 5$ .

d) **Incorreto.**  $n(A \cap C) = 3$ .

e) **Incorreto.** Se  $A \cap B = \emptyset$ , então o conjunto universo terá mais de 7 elementos.

15) Resposta: B

#### Resolução

$$A = \begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix} = \begin{pmatrix} 2 & 3 & 4 \\ 3 & 4 & 5 \\ 4 & 5 & 6 \end{pmatrix}$$

$$B = \begin{pmatrix} b_{11} & b_{12} & b_{13} \\ b_{21} & b_{22} & b_{23} \\ b_{31} & b_{32} & b_{33} \end{pmatrix} = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \\ 4 & 8 & 12 \end{pmatrix}$$

(V)  $A = A'$

(V)  $1, 2, 3 \rightarrow \text{P.A. } r = 1$

$2, 4, 6 \rightarrow \text{P.A. } r = 2$

$4, 8, 12 \rightarrow \text{P.A. } r = 4$

$$(V) AB = \begin{pmatrix} 2 & 3 & 4 \\ 3 & 4 & 5 \\ 4 & 5 & 6 \end{pmatrix} \begin{pmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \\ 4 & 8 & 12 \end{pmatrix} = \begin{pmatrix} 24 & 24 & 72 \\ 31 & 62 & 93 \\ 38 & 76 & 114 \end{pmatrix}$$

(F)  $C = A - B$

$$C = \begin{pmatrix} 2 & 3 & 4 \\ 3 & 4 & 5 \\ 4 & 5 & 6 \end{pmatrix} - \begin{pmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \\ 4 & 8 & 12 \end{pmatrix} = \begin{pmatrix} 1 & 1 & 1 \\ 1 & 0 & -1 \\ 0 & -3 & -6 \end{pmatrix}$$

$$\begin{vmatrix} 1 & 1 & 1 \\ 1 & 0 & -1 \\ 0 & -3 & -6 \end{vmatrix} = -3 - 3 + 6 = 0$$

$\det = 0 \Rightarrow \bar{N}$  – inversível