Instructions : Choose the letter of the best answer. In all cases, choice E) NOTA means "none of these answers".

1) Which property is $4(2x + 5) = (4 \bullet 2x) + (4 \bullet 5)$ an example of?

    A) Commutative Property of Addition B) Associative Property of Addition
    C) Multiplicative Identity   **D) Distributive Property**
    E) NOTA

2) Refer to $\triangle ABC$ to find the measure of $\angle ABC$.
The measure of $\angle ABC$ is twice the measure of
$\angle BCA$. The measure of $\angle CAB = 75°$.
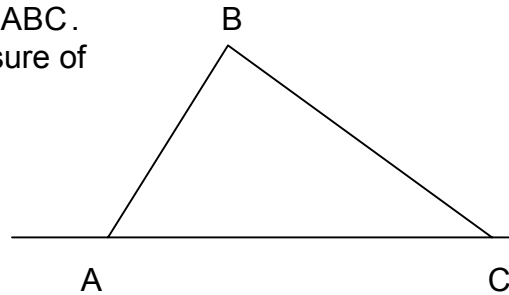
    A) 35°   **B)** $52\dfrac{1}{2}°$ **C) 70°**

    D) 105°   **E) NOTA**

3) $P(x) = 2004x^{2004} + 2004x^{2003} + 2004x^{2002} + 2004x^{2001} + ... + 2004x^{0}$
Find the remainder when P(x) is divided by $x + 1$.

    A) 2004   **B) 1**   **C) 0**   **D) –1**   **E) NOTA**

4) Find the sum of the entries of A^{-1} if $A = \begin{bmatrix} 7 & 9 \\ -4 & 5 \end{bmatrix}$. Note : A is a matrix.

    A) 17   **B) 7**   **C)** $\dfrac{7}{71}$ **D)** $\dfrac{17}{71}$ **E) NOTA**

5) Simplify. $\left(-\dfrac{625}{256} \right)^{-\frac{3}{2}}$ **A)** $\dfrac{15625}{4096}$ **B) 1.8131…**   **C) 0.5515…**   **D)** $\dfrac{4096}{15625}$ **E) NOTA**

6) During a Halloween party, Lawrence and Catie both bit at the same instant into opposite sides of an apple. Sadly, a large worm (ugh!) was inside the apple. Lawrence bit off $\dfrac{r^2 - s^2}{2s^2 - rs - r^2}$ of the length of the worm while Catie bit off $\dfrac{r^2 - 4s^2}{s^2 + rs - 2r^2}$ as much of the length of worm as Lawrence did. What fraction of the entire worm did Catie bite off?

    A) $\dfrac{1}{4s}$ **B)** $\dfrac{(r-s)(r+s)(2r+s)}{(2s+r)(r-2s)(r+2s)}$ **C)** $\dfrac{(r+s)(r-2s)}{(2r+s)(r-s)}$ **D)** $\dfrac{(r+2s)(2s-r)(2s+r)}{(2r+s)(s-r)(r+s)}$ **E) NOTA**

7) Josh Beckett of the Florida Marlins pitches the ball towards the batter so that the ball covered in consecutive intervals of time for that one pitch these distances : $\dfrac{D}{6}, \dfrac{D}{36}, \dfrac{D}{216}$, and so forth. How far was Beckett from the batter in terms of D? Note : D > 0.

A) $\dfrac{D}{5}$ B) $\dfrac{D}{6}$ C) 6D   D) 60 feet, 6 inches   E) NOTA

8) Multiply. $\begin{bmatrix} 6 & 3 \\ -4 & 5 \\ 2 & -1 \end{bmatrix} \begin{bmatrix} -2 & -3 \\ 1 & 4 \end{bmatrix}$

Note : We are multiplying matrices here. The answers for answer choices A, B, and C are also matrices.

A) $\begin{bmatrix} -15 & -30 \\ 3 & -8 \\ -3 & -2 \end{bmatrix}$ B) $\begin{bmatrix} 7 & 10 \\ -1 & 2 \\ 0 & 2 \end{bmatrix}$ C) $\begin{bmatrix} -9 & -6 \\ 13 & 32 \\ -5 & -10 \end{bmatrix}$ D) Can not be done   E) NOTA

9) Alice has an elliptical shaped area in her backyard in which to practice volleyball. She wants to paint the area, which she measured and found the major axis to be 56 feet long and the minor axis to be 24 feet long. Each gallon of paint will cover 200 square feet of area. How many gallons of paint should Jennifer buy to paint the entire area?

A) 22   B) 21   C) 6   D) 5   E) NOTA

10) Suppose you bought a new car on January 23, 2004 for $23,000. The value of the car decreases by 18% per year beginning the moment you buy the car. What will the car be worth on January 23, 2012? Round your answer to the nearest penny.

A) $18298.48   B) $4701.52   C) $2125.66   D) $0.03   E) NOTA

11) Shira is tracking a comet that she discovered, that is in a parabolic orbit around the sun. She placed the orbit of the Shira Comet (what else!) on a coordinate plane and determined that her comet's orbit around the Sun reaches a point (0, -2) before turning. The comet also passes through the point (-4, 2). Determine the coordinates of the sun, which is at the focus of the parabolic orbit.

A) $(1, -2)$ B) $\left(-\dfrac{1}{4}, -2\right)$ C) $(0, -2)$ D) $(-1, -2)$ E) NOTA

12) Simplify. $\sqrt[5]{7^{4.4} \cdot 7^{-6.3} \div 7^{-8.1}}$

A) $7^{6.2}$ B) $7^{1.24}$ C) $7^{0.52}$ D) 7^{-2} E) NOTA

13) Ashley wants to gift wrap Katie's birthday present, pure Columbian coffee, which is in a cylinder whose diameter is 4 inches and height is 6 inches. If Ashley wrapped the present perfectly, that is without extra paper, how much gift-wrap will she need to cover the entire surface of the cylinder in square inches?

$\quad$ A) 8π $\qquad$ B) 24π $\qquad$ C) 32π $\qquad$ D) 56π $\qquad$ E) NOTA

14) $\dfrac{3x+16}{x^2-x-6} = \dfrac{A}{x-3} + \dfrac{B}{x+2}$. Find $A + B$.

$\quad$ A) 3 $\qquad$ B) –3 $\qquad$ C) $6x^2+29x-16$ $\qquad$ D) $3x + 16$ $\quad$ E) NOTA

15) If $\sqrt{35+14\sqrt{6}} = \sqrt{x} + \sqrt{y}$, find $|x-y|$.

$\quad$ A) 23 $\qquad$ B) 21 $\qquad$ C) 7 $\qquad$ D) 1 $\qquad$ E) NOTA

16) Rationalize the denominator. $\dfrac{1}{\sqrt[3]{4} + \sqrt[3]{10} + \sqrt[3]{25}}$

$\quad$ A) $\dfrac{\sqrt[3]{4} + \sqrt[3]{10} - \sqrt[3]{25}}{9}$ $\qquad$ B) $\dfrac{-\sqrt[3]{4} + \sqrt[3]{10} + \sqrt[3]{25}}{31}$ $\qquad$ C) $\dfrac{\sqrt[3]{2} - \sqrt[3]{5}}{3}$

$\quad$ D) $\dfrac{\sqrt[3]{5} - \sqrt[3]{2}}{3}$ $\qquad$ E) NOTA

17) Which of the following examples must represent a step function?

$\quad$ **A) The rate at which a human being grows.**
$\quad$ **B) The path of a cannonball shot from a canon.**
$\quad$ **C) The cost of postage for mailing a letter.**
$\quad$ **D) The concentration of kool aid as you add water to the solution.**
$\quad$ **E) NOTA**

18) There is a big sale at D'Souza's Discount Store. There is the 40% discount given every day and, today only, an additional 20% is being taken off the discounted price of all items. Wanda buys a coat that usually sells for $50 and shoes that usually sell for $75. How much will Wanda have to pay for the items taking into account the two discounts and the sales tax that is 6%?

$\quad$ A) $10.60 $\qquad$ B) $53.00 $\qquad$ C) $63.60 $\qquad$ D) $68.90 $\qquad$ E) NOTA

19) Paul and Greg are going to the Kitch's to mow their 24,000 square foot lawn. Paul arrives first and begins mowing. He finishes mowing 6000 square feet in the one hour it takes for Greg to arrive (who has his own lawn mower). They mow the remaining lawn working together in 1 hour, 48 minutes. How long would it take if Greg mowed all of the Kitch's lawn alone?

$\quad$ A) 6 hours $\qquad$ B) $3\dfrac{3}{11}$ hours $\qquad$ C) $\dfrac{11}{36}$ hours $\qquad$ D) $\dfrac{1}{6}$ hours $\quad$ E) NOTA

20) Find the constant term in the expansion of $\left(3x^2 - \dfrac{2}{x^3}\right)^{15}$.

A) –6304858560   B) –5005   C) 5005   D) 6304858560   E) NOTA

21) Dumb and Dumber are in Canada on vacation. Dumb is watching The Weather Channel and notes it is 30° outside. Dumb shouts, "Boy, it's cold outside." Dumber responds, "You are so dumb. Canada doesn't use the English system like we do. Their temperatures are in Celsius [centigrade]. It's really 30° Celsius outside." Help Dumb and Dumber determine the Fahrenheit temperature outside.

A) –3.6°   B) 22°   C) 86°   D) 111.6°   E) NOTA

22) Out of 500,000 teenage drivers, an insurance company found that 25,000 of them could be expected to be in an accident each year. Paul, Naomi, and Zachary are three teenage drivers. What is the probability that exactly two of them will be in an accident this year?

A) 0.1   B) 0.0025   C) 0.007125   D) 0.0002375
E) NOTA

23) David is a military intelligence officer in Iraq. He obtained a secret numerical code with four missing numbers, R, S, T, and V, distributed in the pattern 39, R, S, T, V, 82.
David knows that $\dfrac{T}{S} = \dfrac{R}{39} = \dfrac{V}{T} = \dfrac{S}{R} = \dfrac{82}{V}$. Find the values of R, S, T, and V, add them up, then round the sum to the nearest whole number. What is your answer?

A) 229   B) 242   C) 640   D) 1379   E) NOTA

24) Find the sum of all the values of x such that $\begin{vmatrix} x & 1 & 1 \\ 1 & x & 1 \\ 1 & 1 & x \end{vmatrix} = 0$.
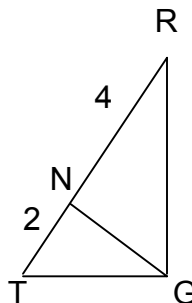
A) 2   B) 1   C) 0   D) –1   E) NOTA

25) Find the inverse of $g(x) = \log_5 x$.

A) $g^{-1}(x) = 5^x$ B) $g^{-1}(x) = x^5$ C) $g^{-1}(x) = \log_x 5$
D) Inverse does not exist   E) NOTA

26) Find the length of side TG of $\triangle TRG$.
The measure of $\angle RNG = 90°$ and the
measure of $\angle RGT = 90°$.

A) 3   B) $2\sqrt{3}$ C) $2\sqrt{6}$
D) 12   E) NOTA

27) The worm that was in the apple at the Halloween party described before really had tried to get out of the apple before its untimely demise. In four consecutive hours, the worm climbed these lengths : $\log_6 36$ cm. the first hour, $\log_{\frac{1}{2}} \frac{1}{8}$ cm. the second hour, $\log_3 \frac{3}{\sqrt{3}}$ cm. the third hour, and $\log_4 2$ cm. the fourth hour. How many total centimeters did the worm climb in its valiant attempt to survive?

   A) 9   **B) 8**   **C) 6**   **D) 0**   **E) NOTA**

28) Find the units digit of 3^{2004} .

   A) 1   **B) 3**   **C) 7**   **D) 9**   **E) NOTA**

29) Dr. Frank N. Stein is mixing a potion to upgrade his "invention". He has 60 grams of "Bring the Brain Back to Life (BBBL)" potion that is 43% pure. How many grams of 80% pure BBBL potion does Dr. Stein need to add to end up with a 60% pure potion?

   A) 41   **B) 51**   **C) 61**   **D) 71**   **E) NOTA**

30) Find the maximum number of negative real zeros possible for
   $P(x) = -6x^7 - 2x^6 + 3x^5 + 2x^4 - 7x^3 + x^2 - 9x - k, \ k > 0.$

   A) 1   **B) 2**   **C) 3**   **D) 4**   **E) NOTA**