EST I – Math w/o Calculator

Date	03 June 2022
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Duration: 30 minutes

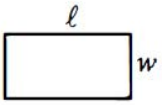
20 Multiple Choice Questions

Instructions:

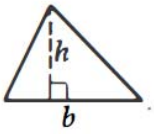
- Place your answer on the answer sheet. Mark only one answer for each of the multiple choice questions.
- Avoid guessing. Your answers should reflect your overall understanding of the subject matter.
- Formula sheet is available on the next page of the booklet for your reference.

Reference:

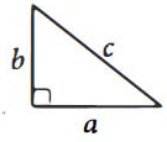
$A = \pi r^2$
$C = 2\pi r$



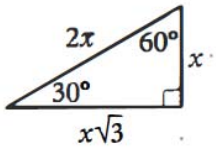
$A = \ell w$

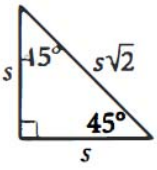


$A = \frac{1}{2}bh$

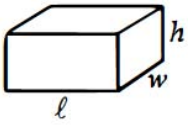


$c^2 = a^2 + b^2$

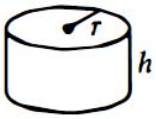




Special Right Triangles



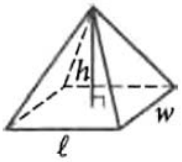
$V = \ell wh$



$V = \pi r^2 h$

$V = \frac{4}{3}\pi r^3$

$V = \frac{1}{3}\pi r^2 h$

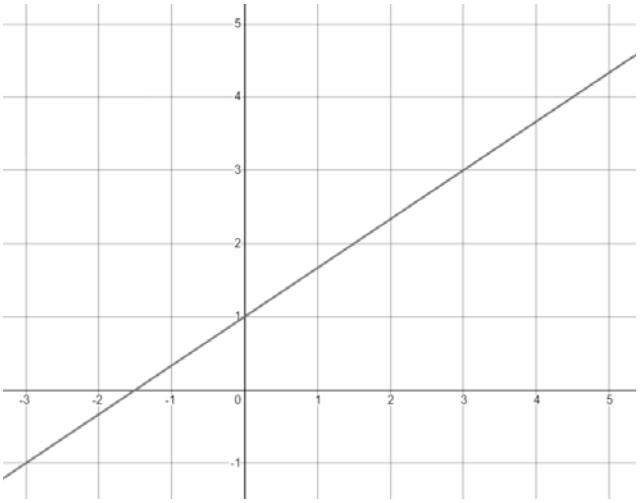


$V = \frac{1}{3}\ell wh$

The number of degrees of arc in a circle is 360.
The number of radians of arc in a circle is 2π.
The sum of the measures in degrees of the angles of a triangle is 180.

1. Given $2x + y = 8$ and $3y + x = -1$. What is the value of $y - 2x$?

A. -16
B. -12
C. -8
D. 8



2. What is the slope of the line represented in the graph above?

A. 2
B. $\frac{3}{2}$
C. 1
D. $\frac{2}{3}$

3. In a company, the total cost, in dollars, of the production of a certain product x is given by $C(x) = \frac{1}{3}x^3 - 15x^2 + 2000x$. The profit made out of selling this product is given by $P(x) = -\frac{1}{3}x^3 + \frac{79}{3}x^2 + 1500x$. If $R(x)$ indicates the revenue made out of selling this product, and the relationship between the cost, the revenue, and the profit is represented by $P(x) = R(x) - C(x)$, which of the following expressions is equivalent to $R(x)$?

A. $R(x) = \frac{64}{3}x^2 + 3500x$
B. $R(x) = \frac{34}{3}x^2 + 3500x$
C. $R(x) = -\frac{2}{3}x^3 + \frac{64}{3}x^2 + 3500x$
D. $R(x) = -\frac{2}{3}x^3 + \frac{124}{3}x^2 - 500x$

4. In Egypt, a tourist can travel a distance of $5\,km$ with just 15.57 EGP. Pedro needed to go to "San Pola" hospital in Cairo. He took a taxi from "Al Marazeek" bridge, which is approximately 35 Km away from the hospital. How much will Pedro pay for the driver, knowing that he gave him 10 extra EGP as tips?

A. 554.95 EGP
B. 477.1 EGP
C. 118.99 EGP
D. 109.09 EGP

5. The sum of three consecutive integers is 24. What is the product of the two greatest integers between them all?

A. 27
B. 56
C. 72
D. 504

6. The impulsive force (f) derives from impulse, and it is a big force acting for a small interval of time. It is like having a truck travelling at a full speed, and suddenly crashing a garden's gate because the driver did not pay attention to it. It can be represented by $f = m\frac{v_f - v_i}{t}$, with m the mass of the body, v_f the final velocity, v_i the initial velocity, and t the time interval through which the force is applied. Which of the following represents v_i in terms of f, m, t, and v_f?

A. $v_i = v_f - \frac{ft}{m}$

B. $v_i = v_f + \frac{ft}{m}$

C. $v_i = v_f - \frac{fm}{t}$

D. $v_i = v_f + \frac{fm}{t}$

7. "Unou House", located in Japan and built between 2010 and 2012, features a house with a floor of triangular shape and can be considered as an isosceles triangle. The area of the triangular floor is approximately $84\ m^2$. If we consider that the base of this triangle is $12\ m$, what is the dimension of one of the equal sides in this triangle?

A. $\sqrt{193}\ m$
B. $2\sqrt{58}\ m$
C. $14\ m$
D. $170\ m$

8. If $x = \sqrt{2} + 3$, what is the value of $2x^2 + 3x - 1$?

A. $5\sqrt{2} + 14$
B. $3\sqrt{2} + 30$
C. $3\sqrt{2} + 24$
D. $15\sqrt{2} + 30$

9. If $4^{2x+4} = 16$, what is the value of 4^{3x}?

A. $\frac{1}{64}$

B. 64

C. 4096

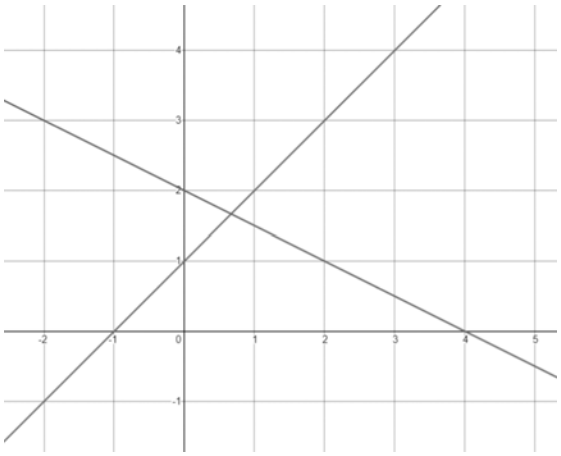
D. $\frac{1}{4096}$

10. If $a + b > 0$, and $a - c < 0$, then $b + c$?

A. Is smaller than 0, with $a < c$
B. Is greater than 0, with $a < c$
C. Is smaller than 0, with $a > c$
D. Is greater than 0, with $a > c$

11. What is the square of the ordinate of the vertex of the graph of the function $f(x) = 3x^2 + 6x$?

A. -6
B. -2
C. 1
D. 9



12. Which of the systems of equations below is being represented in the graph above?

A. $\begin{cases} x + 2y = 4 \\ x - y = 1 \end{cases}$

B. $\begin{cases} x + 2y = 4 \\ -x + y = 1 \end{cases}$

C. $\begin{cases} x - 2y = 4 \\ x - y = 1 \end{cases}$

D. $\begin{cases} x - 2y = 4 \\ -x + y = 1 \end{cases}$

13. What is the value of $[f(g \circ f)(1)]$ if $f(x) = 2x^2 - 3$ and $g(x) = 4x + 1$?

A. -21
B. -15
C. 10
D. 15

14. What number increased by 5 is equal to twice the same number minus 3?

A. -8
B. 3
C. 5
D. 8

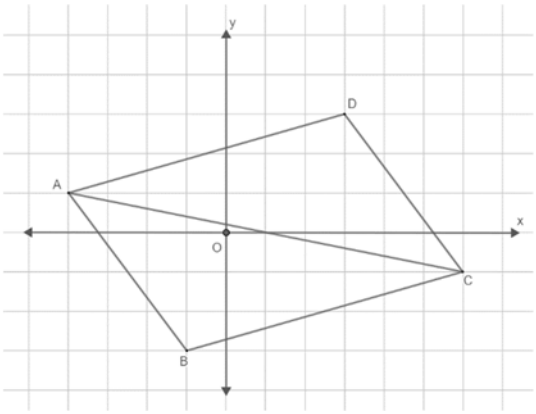
15. What is triple the square root of the discriminant of the equation $4x^2 - 5(x + 3) = -6$?

A. 13
B. 26
C. 39
D. $13\sqrt{3}$

16. Given that $2x^2 + ax + (4c - 1) = (2b - 1)x^2 + 7x + c + 1$, what is the value of $bc + a$, where a, b and c are real numbers?

A. 8
B. $\frac{37}{4}$
C. 7.5
D. $\frac{67}{9}$

Questions 17-18 refer to the figure below.



17. What is the value of $AD^2 + DC$?

A. 53
B. 58
C. 78
D. 48

18. What is the sum of the slope of $\overleftrightarrow{AB}$ and the slope of a line perpendicular to $\overleftrightarrow{AC}$?

A. $\frac{1}{3}$

B. $\frac{11}{3}$

C. $\frac{-23}{15}$

D. $\frac{-5}{8}$

19. What is the smallest value of the range of the function $f(x) = 4x^2 - 2x + 1$?

A. $\frac{1}{4}$

B. $\frac{1}{2}$

C. $\frac{3}{4}$

D. 1

20. $\frac{1}{5}\pi$ radians is how much in degrees?

A. 36°

B. 288°

C. 72°

D. 112°