EST I – Math

Student's Name _____

National ID _____

Test Center _____

Duration: 90 minutes

Test sections: I- Calculator is not required, II – Calculator is required

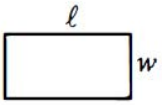
45 Multiple Choice Questions and 13 Short Constructive Response Questions

Instructions:

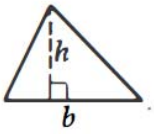
- Place your answer on the answer sheet. Mark only one answer for each of the multiple choice questions.
- Write your final result only on the answer sheet for the constructive response questions.
- Avoid guessing. Your answers should reflect your overall understanding of the subject matter.
- Calculator is allowed. When a calculator is used, be aware of switching between radian mode and median mode.
- Formula sheet is available at the end of the booklet for your reference.

Reference:

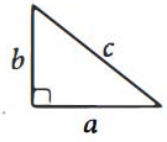
$A = \pi r^2$
$C = 2\pi r$



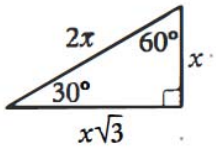
$A = \ell w$

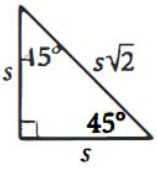


$A = \frac{1}{2}bh$

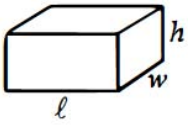


$c^2 = a^2 + b^2$

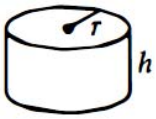




Special Right Triangles



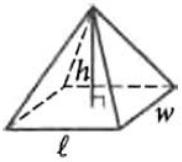
$V = \ell wh$



$V = \pi r^2 h$

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

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



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

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. If x + y = 500 and 3x + 2y = 3000, what is the value of 5x – y?

A. 8000
B. 7000
C. 11500
D. -7000

2. Which of the following is equivalent to $(2x+3)^2+(2x+3)(x-1)-2(4x^2-9)$?

A. $(2x+3)(-x+4)$
B. $2(2x+3)(-3x+4)$
C. $(2x+3)(-x+8)$
D. $(-3x+5)(2x+3)$

3. Which of the following intervals could be part of the solution of the inequality $|3x-3|<3$?

A. $\left]\frac{1}{2},\frac{5}{2}\right[$
B. $\left]\frac{1}{4},\frac{3}{2}\right[$
C. $\left]\frac{-1}{2},\frac{1}{2}\right[$
D. $\left[0,\frac{1}{2}\right[$

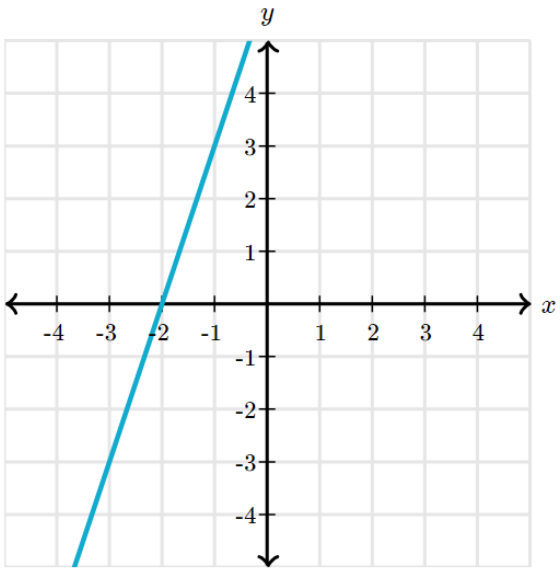
4. If $N=\frac{2h^2+40}{100}$, which of the following could be h in terms of N?

A. $\sqrt{50N+20}$
B. $\sqrt{100N-20}$
C. $\sqrt{50N-20}$
D. $\sqrt{100N+20}$

5. If $\sqrt{x-2}=10$, what is the value of 3x ?

A. 98
B. 102
C. 294
D. 306

6. What is the slope of the line shown in the graph below?



A. -3
B. -1
C. 3
D. 1/3

7. What is the equation of the line (d_1) passing through *A* (3,4) and parallel to the line (d) of equation y= -2x + 5 ?

A. $y=-2x+3$
B. $y=\frac{1}{2}x+10$
C. $y=-2x+10$
D. $y=2x$

8. A circle has a circumference of 400 units.

What is the approximate diameter of the circle?

A. 127 units
B. 215 units
C. 312 units
D. 200 units

9. If $3^{2x-1}=27$, what is the value of $\frac{1}{2}x+3$?

A. 3
B. 0
C. 5
D. 4

10. If $3 - 8x + 5x^2 = 0$, which of the following is a solution for x?

A. 0
B. 2
C. -1
D. 1

11. If k is an integer, and $\frac{k+5+6}{3}$ is greater than 15, what is the lowest possible value of k?

A. 34
B. 35
C. 33
D. 36

12. Amanda paid $\$a$ for a makeup bag set that was only \$15 less than half the original price. What was the original price, in dollars, of this set?

A. $2a + 30$
B. $a - 15$
C. $\frac{1}{2}a - 15$
D. $2a + 15$

13. What is the domain of the function $f(x) = \sqrt{3-x}$?

A.]-∞; +∞[
B.]-∞; +3]
C. [+3; +∞[
D.]-3; 3[

14. The lengths of two sides of a triangle are 4 and 7. Which of the following represents a, the possible length of the remaining side?

A. a>11
B. 3<a<11
C. -3<a<11
D. impossible

15. Starting at sunrise, the temperature rose 1.5 degrees Celsius every hour. After 10 hours, the temperature was 40 degrees Celsius. Which of the following models the temperature y, in Celsius, after x hours from sunrise?

A. $y - 40 = 1.5(x - 10)$
B. $y - 10 = 10(x + 1.5)$
C. $y - 10 = 1.5(x - 40)$
D. $y - 1.5 = 10(x + 40)$

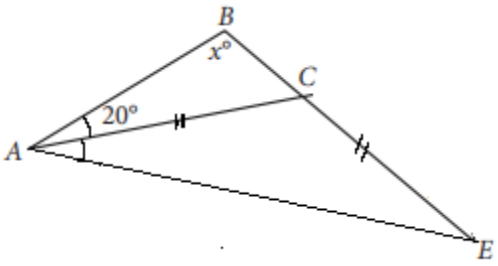
16. Given $f(z) = \left(\frac{1}{3}\right)^z$ and $h(z) = \frac{z+4}{z+1}$.

What is the value of $(h \circ f)(0)$? (grid-in)

17. What positive number is twice as far from 9 as it is far from 3? (grid-in)

18. The function $h(x) = (x^2-a)(4+x) - 112$ has zero at x=4. What is the value of a? (grid-in)

19. Using the figure below, what is the value of x? (grid-in)



Note: figure not drawn to scale

20. What is the abscissa of the vertex of the parabola defined by the quadratic function below?

$g(x) = x^2 - 7x - 4$ (grid-in)

Section II
Calculator is required
(55 minutes)

1. Which of the following is a point of intersection between the line with the equation y= 3x+2 and the parabola with the equation y =$4x^2$ – 9x+11?

   A. (3.5 ; 3)

   B. (4 ; 14)

   C. (-2 ; -4)

   D. (1.5; 6.5)

2. Tony's salary was $4600. It increased by 10% in the first year and decreased by 3% in the second year. What will be the salary of Tony at the end of the second year?

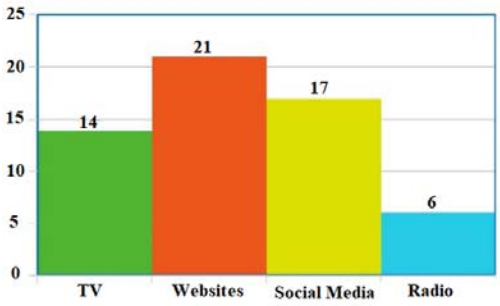
   A. $6500
   B. $5580.4
   C. $4908.2
   D. $4800.6

3. The price of three squash and two zucchini is 10 EGP, while the price of five squash and three zucchini is 16.5 EGP. What is the price of one squash and four zucchini?

   A. 7 EGP
   B. 5 EGP
   C. 10 EGP
   D. 8.5 EGP

Questions 4 and 5 refer to the information below.

The histogram below shows the results of a survey done by a group of students on the source of news their parents trust most.



4. What is the percentage of parents trusting the news from social media platforms in this survey?

   A. 17%
   B. 25.7%
   C. 29.3%
   D. 34%

5. If this survey was conducted on 120 people, and the results showed the same percentage for each source. How many people approximately would say that radio stations or TV channels are the most trustworthy?

   A. 29
   B. 41
   C. 53
   D. 58

6. A rectangle is cut into 20 identical squares such that each has an area of $12.25\ cm^2$. Which of the following cannot be a possible value for the perimeter of the rectangle?

   A. 147 cm
   B. 84 cm
   C. 70 cm
   D. 63 cm

7. If Tony's salary is 25% greater than Sami's salary. Which of the following statements is true?

   A. Sami's salary is lower than Tony's salary by 16%.
   B. Sami's salary is lower than Tony's salary by 20%.
   C. Sami's salary is lower than Tony's salary by 25%.
   D. Sami's salary is lower than Tony's salary by 33%.

8. What is the product of the solutions of $x^3 – 4x^2 – 7x + 10 = 0$?

   A. -10
   B. -12
   C. 14
   D. 5

9. A lobby in a hotel offers 12 choices of fresh juices, 7 choices of smoothies, and 4 choices of milk shakes. A customer can choose to drink just one course, or two different courses, or all three courses. Assuming all choices are available, how many different possible drinks does the hotel offer?

A. 368
B. 128
C. 519
D. 412

10. What is the y-intercept of the line passing through points (5;5) and (-5;-1)?

A. -3
B. 2
C. 0
D. 4

11. If f(x)= $\frac{1}{x} - x$ and g(x)= f(2x), what is the value of g(-3)?

A. $\frac{35}{6}$
B. $\frac{15}{14}$
C. $\frac{5}{7}$
D. $\frac{-4}{7}$

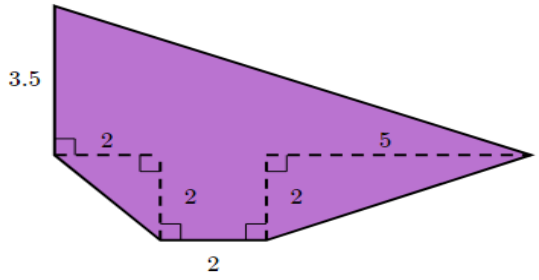
12. Three friends divided a prize as follows: the youngest received $\frac{3}{5}$ of the prize, the middle friend received $\frac{1}{4}$ of the prize, and the eldest received the remaining \$57. What was the value, in dollars, of the prize?

A. 380
B. 420
C. 140
D. 270

13. If $\frac{a}{b}$ is negative, which of the following is definitely negative?

A. $2ab$
B. a^2b
C. $(b-a)^2$
D. a-b

14. What is the area of the shaded region in the figure below?



A. 47.12
B. 26.75
C. 14.72
D. 11.15

15. $ABCD$ is a parallelogram such that A(1;-2), B(1;3), C(-1;3). What are the coordinates of D, the fourth vertex of the parallelogram?

A. D (-1;2)
B. D (-2;-1)
C. D (-1;-2)
D. D (3;2)

16. What is the inverse function of $f(x)= \frac{2x+3}{3x+5}$?

A. $f^{-1}(x) = \frac{-5x-3}{-3x-2}$
B. $f^{-1}(x) = \frac{-3x-5}{-3x-2}$
C. $f^{-1}(x) = \frac{-5x+3}{3x-2}$
D. $f^{-1}(x) = \frac{+3x+5}{+3x+2}$

17. The price of a CD player is 180 €. It is on sale at the price of 135 €. A customer wishes to purchase this device. He has a loyalty card from the store that allows him to benefit from a 10% discount at checkout. How much will he pay for this device?

A. 148.5
B. 121.5
C. 125
D. 145

18. If the graph of $y = ax^2 + 5x + c$ has x-intercepts at 1 and 3, what is the value of $a + c$?

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

19. The price of dairy products has increased by 7% in 2011 and then decreased by 8% in 2012.

What is the new price in 2012 of a box of cheese knowing that the original price in 2010 was $20?

A. $18.85
B. $19.688
C. $19.573
D. $18.24

20. In how many ways can first, second, and third place be awarded to 15 people?

A. 252
B. 302
C. 455
D. 2730

21. In a school, there are 80 students distributed into three classes according to the following table:

	First Secondary	**Second Secondary**	**Third Secondary**
Females	18	17	5
Males	12	18	10

One student is selected at random from this school.

What is the probability that the selected student is from the second secondary?

A. $\frac{17}{35}$
B. $\frac{7}{16}$
C. $\frac{30}{80}$
D. $\frac{18}{35}$

22. In the xy-plane, the perpendicular lines T and K intersect at the point (3,2). If line T contains the point (2,5), which of the following points is on line K?

A. (5,3)
B. (-2,1)
C. (1,2)
D. (6,3)

23. If 5x +2y =12 000, what is the value of -0.625x- 0.25y?

A. 1500
B. -1500
C. 3000
D. -3000

24. Ohm's law states that the current through a conductor between two points is directly proportional to the voltage across the two points. Introducing the constant of proportionality, the resistance, one arrives at the usual mathematical equation that describes this relationship:

$$I = \frac{U}{R}$$

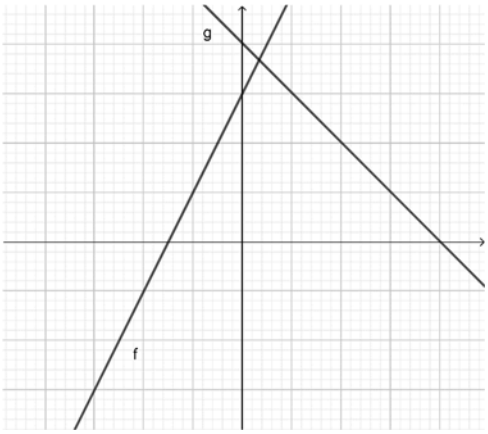
Which of the following statements is true regarding the given formula?

I. If R increases, the current I will increase.
II. If U increases, the current I will increase.
III. If R increases, the current I will decrease.

A. I only
B. II only
C. I and II
D. II and III

25. If $5(x + 2) - 3x \leq 4 + 2x + 3(x - 1)$, what is the solution of x?

A. $x \leq -3$
B. $x \leq 3$
C. $x \geq 3$
D. $x \geq -3$



26. In the xy-plane above, what is the sum of double the slope of g and triple the slope of a line parallel to f?

A. 6
B. 4
C. $\frac{-4}{3}$
D. 2

27. If $\frac{2a + 1.2b}{a - 5} = \frac{4}{5}$, which of the following is correct?

A. 3a+3b = -7
B. a – b = 10
C. a + b = -10/3
D. 2a – b = 5

28. What is the average (arithmetic mean) of 2^{11} and 2^{23}?

A. 2^{17}
B. 2^{15}
C. $2^{10} + 2^{22}$
D. 2^{34}

29. Sami has a website where he sells books and copybooks. He purchases his books for \$10.26 each and his copybooks for \$7.58 each. Sami pays \$1 to mail each book or copybook to his customers. He charges \$19.25 per book and \$11.58 per copybook plus a postage of \$1.25 per book or copybook. Which of the following represents his profit P, in dollars, on the sale of x books and y copybooks?

A. P = 10.26x + 7.58y
B. P = 8.99x + 4 y
C. P = 9.24x + 4.25y
D. P = 9.24x + 4y

30. If $x - 2y = 1$, which of the following is always true?

A. $x - y = 1 - y$
B. $x + y = 1 + y$
C. $2x - y = 1 + 3y$
D. $2y - 2x = -x - 1$

31. The sum of triple a number x and 6 is equal to half the difference of twice a number x and 5. What is the value of (1-4x)? (grid-in)

32. If y varies directly as the square of 3x and y=16 when x=4, what is y when x is equal to 6? (grid-in)

Questions 33, 34 and 35 refer to the following information.

The bar chart above shows the scores of a Math test over 100.

33. What is the median score? (grid-in)

34. What is the range of the scores? (grid-in)

35. How many students score at least 55? (grid-in)

36. Given that $2(16^x) = 64$, what is the value of $2x$? (grid-in)

37. If cos(x)sin(x) = $\frac{1}{2}$, what is the value of $(\cos(x) + \sin(x))^2 + 16 \sin 2x$?

38. The formula for speed is speed = distance ÷ time. If a girl cycles for 2.3 hours at a speed of 42 km/h, what distance does she travel? (grid-in)

EST I - Mathematics

Answer key

	No-Calculator	Calculator		No-Calculator	Calculator
1	C	D	**21**		B
2	C	C	**22**		D
3	B	B	**23**		B
4	C	C	**24**		D
5	D	B	**25**		C
6	C	C	**26**		B
7	C	B	**27**		C
8	A	A	**28**		C
9	D	C	**29**		C
10	D	B	**30**		D
11	B	A	**31**		18
12	A	A	**32**		36
13	B	A	**33**		75
14	B	B	**34**		55
15	A	C	**35**		18
16	2.5 OR 5/2	C	**36**		2.5 OR5/2
17	5	B	**37**		18
18	2	D	**38**		96.6
19	120	B			
20	3.5 or 7/2	D			