HIGH SCHOOL

EST I
MATH

Date:

Test Center:

Room Number:

Student's Name:

National ID:

EST ID:

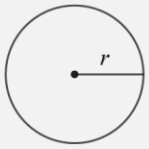
Duration: 75 minutes

50 Multiple Choice Questions

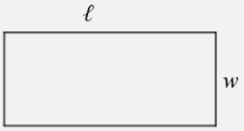
Instructions:

- Place your answers 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.
- Calculator is allowed.

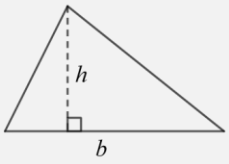
Directions



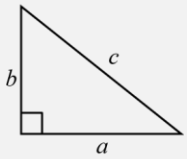
$A = \pi r^2$
$C = 2\pi r$



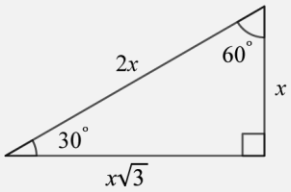
$A = \ell w$

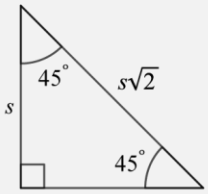


$A = \frac{1}{2}bh$

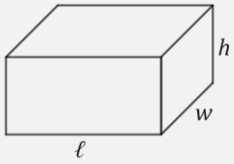


$c^2 = a^2 + b^2$

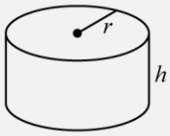




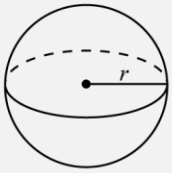
Special Right Triangles



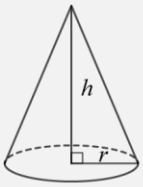
$V = \ell wh$



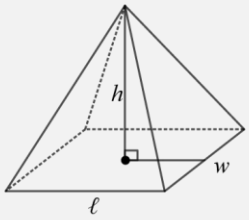
$V = \pi r^2 h$



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



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



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

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.

Question 1. Hana deposited $\$1{,}000$ in her bank account. The function $f(t) = 25t + 1{,}000$ represents the amount, in dollars, in Hana's bank account after t months. What is the best interpretation of 25 in this context?

A. After 1 month, the amount in Hana's bank account is $\$25$.
B. Before Hana made any deposits, the amount in her bank account was $\$25$.
C. For each month, the amount in Hana's bank account increases by $\$25$.
D. Hana made a total of 25 monthly deposits.

Question 2. The remainder when dividing the expression $5x^3 + 4x^2 - 2x + 4$ by $3x + 2$ is:

A. 4
B. $\frac{140}{27}$
C. $\frac{152}{27}$
D. $\frac{152}{9}$

Question 3. If A and B are two equal real numbers such that $A = \frac{3}{2}x - 1 + 2(x - 3)$ and $B = 2x + \frac{1}{7}$, then the value of $3A$ is:

A. -15
B. 0
C. 29
D. 58

$$\begin{cases} 24x + y = 48 \\ 6x + y = 72 \end{cases}$$

Question 4. The solution to the given system of equations above is (x, y). What is the value of y?

A. $y = -10$
B. $y = -\frac{4}{3}$
C. $y = 18$
D. $y = 80$

x	$g(x)$
b	18
$b + 5$	24
$b + 25$	n

Question 5. The given table represents the linear function $g(x)$.
What is the value of $n + g(b + 15)$?

A. 72
B. 78
C. 84
D. 90

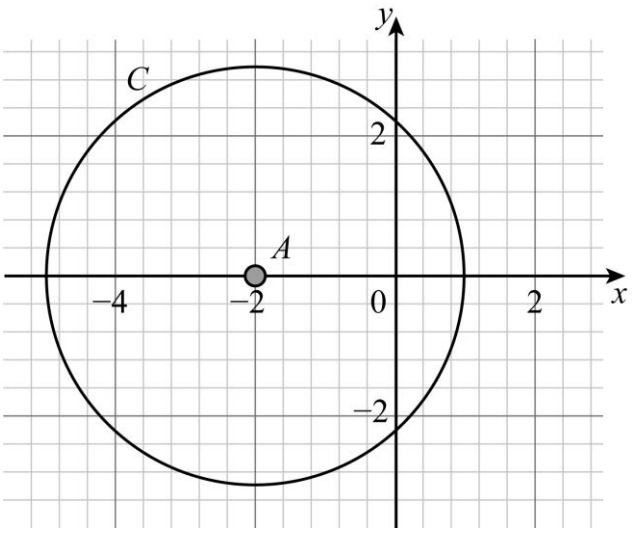
Question 6. For a certain rectangular region, the ratio of its length to its width is $35:10$. If the width increases by 7 units, by how many units must the length increase to keep the same ratio?

A. 12.5
B. 14.0
C. 24.5
D. 28.0

	Red	**Blue**	**Yellow**
Square	10	20	25
Pentagon	20	10	15

Question 7. The table above shows the distribution of color and shape of 100 tiles of equal area. If one of these tiles is selected at random, what is the probability of selecting a red tile?

A. 0.30
B. 0.25
C. 0.20
D. 0.15



Question 8. Circle C of center A (shown above) is translated downward by 6 units and scaled by a factor of 2. Which equation defines the new circle?

A. $(x+2)^2+(y+6)^2=36$

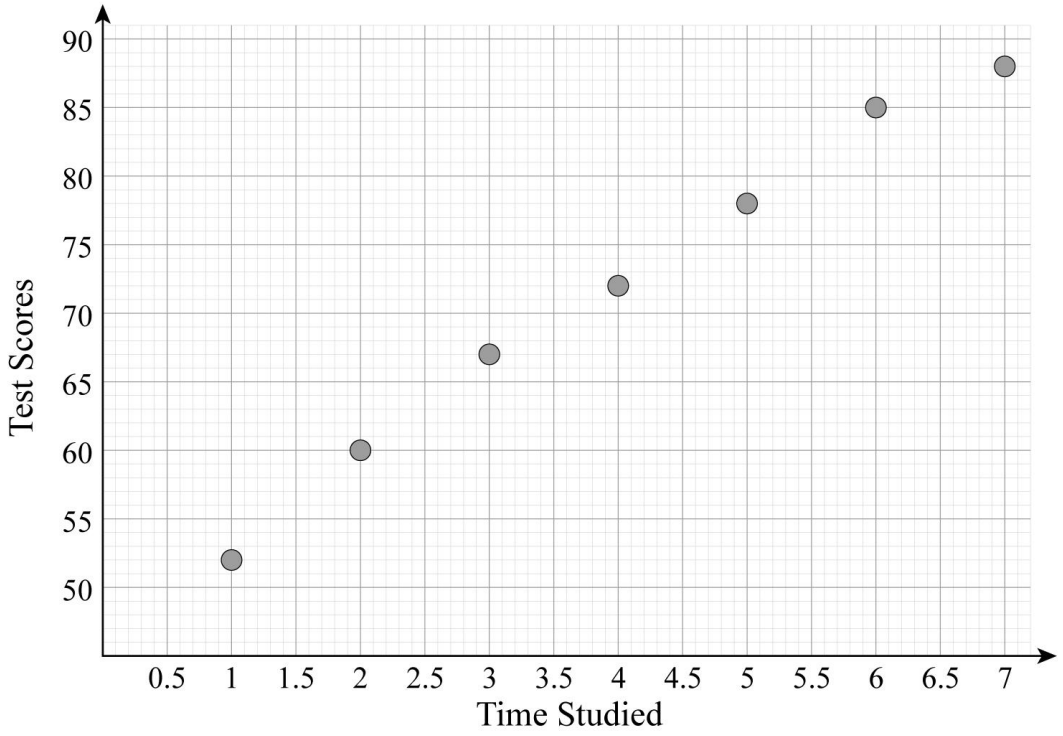
B. $\frac{1}{2}(x+2)^2+\frac{1}{2}(y+6)^2=9$

C. $2(x+2)^2+2(y-6)^2=9$

D. $(x+2)^2+(y-6)^2=36$

Questions 9 and 10 refer to the information below:

A group of students recorded the amount of time x they studied for a math test (in hours) and their corresponding test scores y out of 100. The results are shown below:



Question 9. Which of the following equations is the most appropriate linear best-fit model for the data shown?

A. $y = 6x + 45.0$
B. $y = 6x + 47.6$
C. $y = 47.6x - 6$
D. $y = \frac{1}{6}x + 47.6$

Question 10. Based on the line of best fit, what is the expected grade of a student who studied for 8 hours?

A. 48.9
B. 52.1
C. 95.6
D. 97.6

Question 11. A company can produce 20 shirts every day at a cost of \$10 per shirt. What is the total cost for producing shirts during 70 days?

A. \$200
B. \$700
C. \$1,400
D. \$14,000

Questions 12 and 13 refer to the information below:

$$16, 19, 13, 20, 15, 22, 21, 14, 16, 24$$

Each value in the data set above represents the height, in centimeters, of plants used to decorate table sets.

Question 12. What is the mean height of these plants?

A. $16\ cm$
B. $17\ cm$
C. $18\ cm$
D. $19\ cm$

Question 13. Three new plants are added to the decoration. The new mean height of the plants becomes $17\ cm$. What could be the heights of the three newly added plants?

A. $10\ cm$, $13\ cm$, $14\ cm$
B. $10\ cm$, $13\ cm$, $17\ cm$
C. $10\ cm$, $14\ cm$, $15\ cm$
D. $10\ cm$, $15\ cm$, $16\ cm$

Question 14. Which expression is equivalent to $\frac{y+12}{x-8} + \frac{y(x-8)}{x^2y-8xy}$?

A. $\frac{xy+y+4}{x^3y-16x^2y+64xy}$

B. $\frac{xy+9y+12}{x^2y-8xy+x-8}$

C. $\frac{xy^2+13xy-8y}{x^2y-8xy}$

D. $\frac{xy^2+13xy-8y}{x^3y-16x^2y+64xy}$

$$A(x) = (2x - 3)(2x + 3) - (2x^2 + x - 3)$$

Question 15. The simplified form of $A(x)$ is:

A. $2x^2 - x - 6$

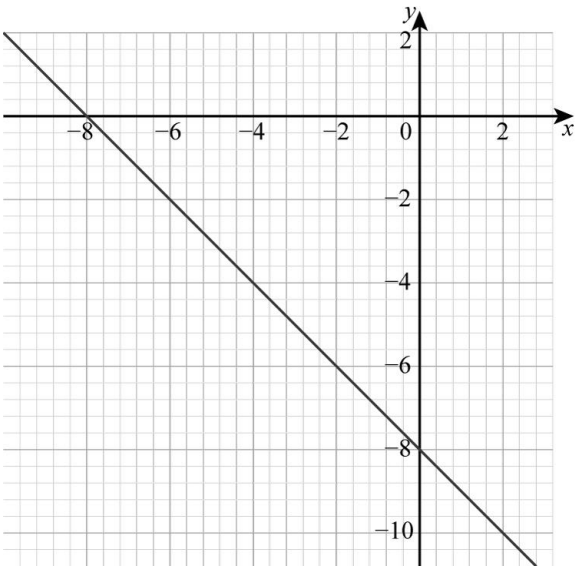
B. $2x^2 - x + 6$

C. $2x^2 + x - 6$

D. $4x^2 - x - 6$

Question 16. The length of a rectangle is $4\ cm$ less than 7 times its width, $a\ cm$. If the area of the rectangle is $155\ cm^2$, what is the value of a?

A. $-\frac{31}{7}$
B. 4
C. 5
D. 7



Question 17. What is the equation of the graph shown above?

A. $y = -2x - 8$
B. $y = -x - 8$
C. $y = x - 8$
D. $y = 2x - 8$

Player	**Goals scored in the World Cup**
Kevin	3
Toni	4
Harry	4
Cristiano	4
Mohamed	6
Lionel	6
Kylian	8

Question 18. Given the table of data presented above, M_e is the median and M_o is the mode. What is the value of $M_e - M_o$?

A. 0
B. 1
C. 2
D. 3

$$\begin{cases} y \leq x + 7 \\ y \geq -2x - 1 \end{cases}$$

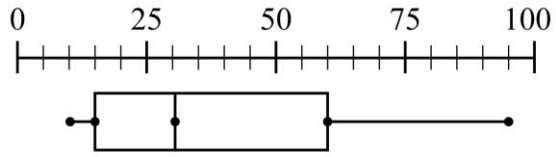
Question 19. Which of the following points (x, y) satisfies the system of inequalities in the xy-plane?

A. $(-14, 0)$
B. $(0, -14)$
C. $(0, 14)$
D. $(14, 0)$

Question 20. A printer produces 120 pages in 15 minutes. What is the unit rate in pages per minute?

A. 6
B. 8
C. 10
D. 12

Question 21. The box-and-whisker plot below shows the weight of 100 pumpkins (in lb) in a market.



According to the plot, what is the median weight of a pumpkin?

A. $15\ lbs$
B. $30\ lbs$
C. $60\ lbs$
D. $95\ lbs$

Question 22. What is the interquartile range of the numbers $4, 6, 7, 8, 10, 12, 20$?

A. 6
B. 8
C. 12
D. 16

Question 23. If $P = \frac{5\sqrt{y}}{3}$ and $Q = \frac{P^3}{y^{\frac{3}{2}}}$, what is the simplified form of Q?

A. $\frac{27}{125}$

B. $\frac{125}{27}$

C. $\frac{125}{27\sqrt{y}}$

D. $\frac{125\sqrt{y}}{27}$

Questions 24 and 25 refer to the following information:

The students at a school are distributed across four sections in grades 10 and 11 as shown in the table below:

Class Section	Number of Students
10-A	28
10-B	25
11-A	30
11-B	24

Last month, students took a mathematics exam. The results were as follows:

- In grade 10, 25% of students in 10-A and 32% of students in 10-B failed.
- In grade 11, 20% of students in 11-A and 50% of students in 11-B failed.

Question 24. What is the ratio of failing students in grade 11 to passing students in grade 10?

A. $8:15$
B. $9:18$
C. $9:19$
D. $15:13$

Question 25. A student is selected randomly from grade 11 to represent the school in a mathematics competition. What is the probability that he had passed his test?

A. $\frac{5}{17}$
B. $\frac{1}{3}$
C. $\frac{3}{8}$
D. $\frac{2}{3}$

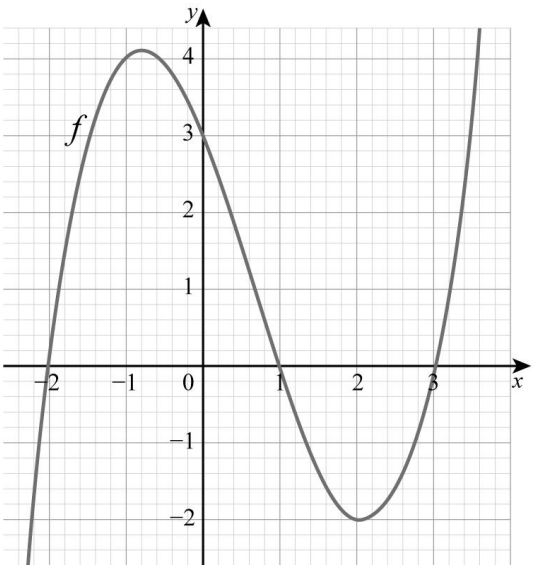
Question 26. A circle is circumscribed around a square that has a diagonal of length $12\sqrt{2}\ cm$. The area of the circle is:

A. $36\pi\ cm^2$
B. $72\pi\ cm^2$
C. $144\pi\ cm^2$
D. $288\pi\ cm^2$

Question 27. A rectangle has a length that is 3 units more than its width. The area of the rectangle is 54 square units. If the width is equal to x, which of the following statements is/are true?

I. $x^2 + 3x = 54$
II. $2x + 3 = \sqrt{225}$
III. The width is 6 units.
IV. The perimeter of the rectangle is 30 units.

A. **I** only
B. **II** only
C. **I**, **II**, and **III** only
D. All statements are true

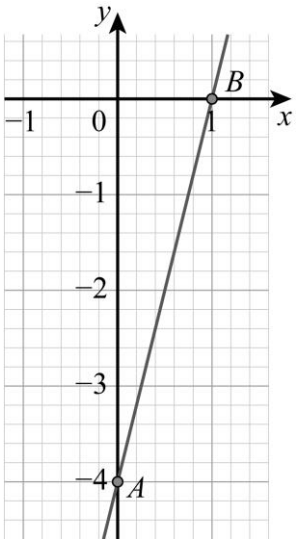


Question 28. Which of the following equations can be the one for the function f represented by the graph above?

A. $f(x) = x(x+2)(x-3)$
B. $f(x) = x^2 + 2x + 3$
C. $f(x) = x^3 - x^2 - 6x + 3$
D. $f(x) = \frac{1}{2}(x+2)(x-1)(x-3)$

Question 29. Consider the line l passing through points A and B in the adjacent figure. What is the y-intercept of the line perpendicular to l and passing through $(2, 0)$?

A. -0.5
B. 0.5
C. 1.0
D. 2.0



Question 30. A line d with equation $|u-5|x+uy-3u+5=0$ passes through $(1,-6)$. What can be the value of u?

A. -1

B. 1

C. $\frac{5}{4}$

D. 2

Question 31. Nadine can type 250 words in 5 minutes, but she takes a 40-second break every 2 minutes. If she worked for 10 minutes, including breaks, how many words did she presumably type?

A. 300
B. 333
C. 350
D. 400

Question 32. The function f is defined by $f(x)=(3x+2)^2-9x^2-36$, and a is a real number such that $f(a)=0$. The value of $3a+2$ is:

A. 8
B. 9
C. 10
D. 12

Question 33. Given $f(x)=\frac{5}{3x^2-5x+2}=\frac{m}{x-a}+\frac{n}{x-b}$, what is the value of $a+b$?

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

B. $\frac{5}{3}$

C. $\frac{6}{3}$

D. $\frac{7}{3}$

Question 34. A fake die has 6 faces labeled $2,3,3,4,6,7$. When rolled, the probability of getting a prime number is expressed as $\frac{k-2}{6}$. What is the positive value of k?

A. 2
B. 4
C. 6
D. 8

Question 35. The coordinates of A, the intersection between $d: y = 2(a + x)$ and $l: y = -\frac{1}{4}(8x + a)$, are:

A. $\left(-\frac{9}{16}a, \frac{7}{8}a\right)$

B. $\left(-\frac{7}{16}a, \frac{9}{8}a\right)$

C. $\left(-\frac{9}{16}a, \frac{9}{8}a\right)$

D. $\left(-\frac{7}{16}a, \frac{7}{8}a\right)$

Question 36. A customer bought 2 kilograms of apples and 5 kilograms of oranges and paid \$17. Another one paid \$20 for 4 kilograms of apples and 3 kilograms of oranges. What is the price of apples per kilogram?

A. \$2.00
B. \$2.50
C. \$3.00
D. \$3.50

Question 37. Given the two functions represented by the sets $f = \{(7,4), (2,3), (0,1), (11,3)\}$ and $g = \{(3,0), (7,2), (4,0), (2,11)\}$.

Which of the following statements is/are true?

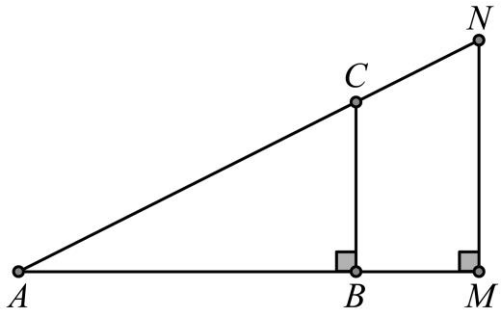
I. $f(g(7)) > g(f(7))$

II. $f(g(3)) < g(f(7))$

III. $g(f(7)) = g(f(2))$

A. **I** only
B. **II** only
C. **I** and **III** only
D. All statements are true

Question 38. In the adjacent figure, $AB = 2\sqrt{3} + \sqrt{5}$, $BC = \sqrt{5} - \sqrt{3}$, $AM = 10$, and $MN = \frac{a+b\sqrt{15}}{c}$. Which of the following is $a + b \times c$, if a, b, and c are integers?

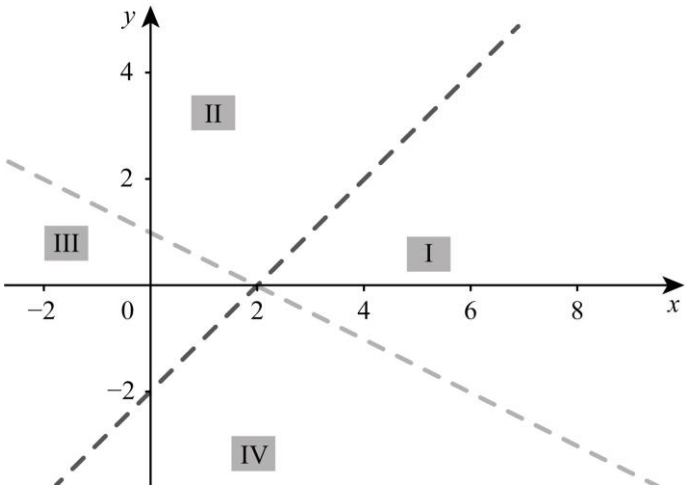


A. -320
B. -100
C. 100
D. 210

$$\frac{16^{x+1} \times 8^{2x}}{4^{3x-2}} = 2^{5x+6}$$

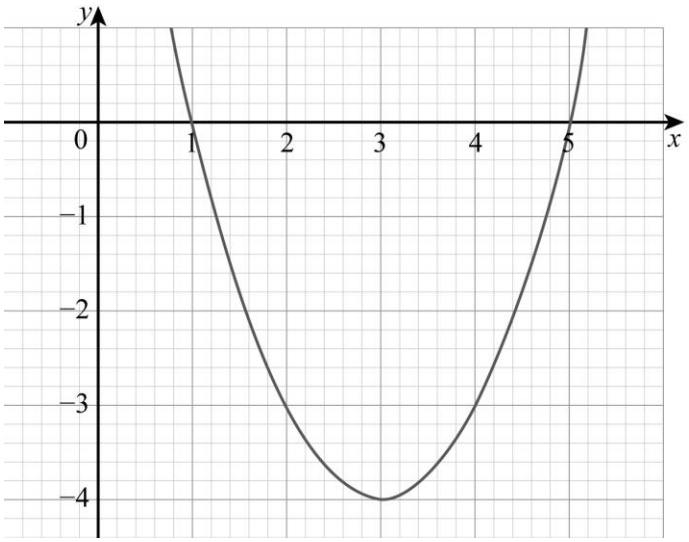
Question 39. The solution of the equation above is $x = y^2 - 2$. Which of the following can be y?

A. 2
B. 0
C. -1
D. -4



Question 40. Given the system of equations $\begin{cases} 2y + x - 2 > 0 \\ x - y - 2 < 0 \end{cases}$, which of the regions shown is a solution of the given system?

A. Region I
B. Region II
C. Region III
D. Region IV



Question 41. Which of the functions is represented by the graph in the figure above?

A. $f(x) = -x^2 + 6x - 5$

B. $f(x) = x^2 - 6x + 5$

C. $f(x) = 2x^2 + 6x - 3$

D. $f(x) = (x + 3)^3 - 4$

Question 42. The simplified form of the expression $2 \times \frac{3+4i}{1-i}$ is:

A. $-7 + i$
B. $-1 + 7i$
C. $1 + 7i$
D. $7 - i$

Question 43. If $f(x) = |2x - 5| + |x + 3|$, then a point that does not belong to the graph of f is:

A. $(0, 8)$

B. $(8, 22)$

C. $\left(\frac{5}{2}, \frac{11}{2}\right)$

D. $(3, 6)$

Question 44. In a triangle, the angles measure $(4x - 20)°$, $(2x + 15)°$, and $(x + 45)°$. What is the value of the largest angle?

A. $65°$
B. $60°$
C. $55°$
D. $20°$

Question 45. Consider the functions $f(x) = x^2 + 4x$ and $g(x) = x + 4$. They intersect at points A and B. What is the length of $\overline{AB}$?

A. $6\sqrt{3}$
B. 8
C. $5\sqrt{2}$
D. $\sqrt{34}$

Questions 46 – 47 refer to the information below:

Physicists use the formula $h = \frac{v^2 \sin^2(\theta°)}{2g}$ to calculate the maximum height h reached by a projectile, where:

- v is the initial velocity (in m/s).
- θ is the angle of launch.
- g is the acceleration due to gravity ($\approx 9.8\, m/s^2$).

Question 46. The velocity of the projectile as a function of the angle of launch and the height reached is:

A. $v = \frac{\sqrt{2gh}}{\sin^2(\theta°)}$

B. $v = \frac{\sqrt{gh}}{2\sin(\theta°)}$

C. $v = 2\sqrt{\frac{gh}{\sin(\theta°)}}$

D. $v = \sqrt{\frac{2gh}{\sin^2(\theta°)}}$

Question 47. A ball is launched with an initial velocity of $30\, m/s$ at an angle of $60°$. What is the maximum height the ball reaches?

A. $28.5\, m$
B. $34.4\, m$
C. $39.7\, m$
D. $45.2\, m$

Question 48. The function f is defined by $f(x) = x - 1$. $f^{-1}(0) =$

A. -1
B. 0
C. $\frac{1}{2}$
D. 1

Question 49. The graph of $f(x) = -2x^2 + 8x - 1$ has an axis of symmetry at:

A. $x = -2$
B. $x = 0$
C. $x = 2$
D. $x = 4$

Question 50. If $f(x) = 2x^2 + 8x + 2$ and $g(x) = -f(x + 3)$, then $g(0) =$

A. -44
B. -4
C. -2
D. 2