

Mathematics, 2014 EC, social science, entrance exam, round 1

Grade 12 · Mathematics · 2014 E.C.

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Time allowed: 120 minutes

Questions: 50

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1. A closed right circular cone has a base radius 2 cm and slant height $3\sqrt{2}$ cm. What is the total surface area of the cone? (1)

- A. $2\pi(1+3\sqrt{2}) \text{ cm}^2$ B. ✓ $2\pi(2+3\sqrt{2}) \text{ cm}^2$
C. $6\pi/\sqrt{4} \text{ cm}^2$ D. $2\pi/\sqrt{4} \text{ cm}^2$

Answer: B

The total surface area of a closed cone is given by $A = \pi r(r + l)$. Substituting $r = 2$ cm and $l = 3\sqrt{2}$ cm gives $A = 2\pi(2 + 3\sqrt{2}) \text{ cm}^2$.

2. The lower and upper bases of the frustum of a regular pyramid are equilateral triangles of side 3 cm long and 2 cm long respectively. If its slant height is 4 cm, then what is the lateral surface area of the frustum? (1)

- A. ✓ 30 cm^2 B. 48 cm^2
C. 72 cm^2 D. 96 cm^2

Answer: A

The lateral surface area of a regular pyramid frustum is $LSA = (1/2) * (P_1 + P_2) * h_s$, where P_1 and P_2 are the perimeters of the bases (9 cm and 6 cm) and h_s is the slant height (4 cm). This gives $LSA = 0.5 * 15 * 4 = 30 \text{ cm}^2$.

3. Which one of the following is true about the signum function, $f(x) = \text{sgn } x$? (1)

- A. ✓ Its domain is the set of real numbers B. Its range is the set of real numbers
C. Its domain is $\{-1, 0, 1\}$ D. Its range is $[0, \infty)$

Answer: A

The signum function $f(x) = \text{sgn}(x)$ is defined for all real numbers, so its domain is the set of real numbers, which makes option A correct.

4. Which one of the following is the equation of a circle with center (2, -1) and radius 3 units? (1)

- A. $x^2 + y^2 + 2x + 2y - 4 = 0$ B. ✓ $x^2 + y^2 - 4x + 2y - 4 = 0$
C. $x^2 + y^2 + 4x - 2y - 5 = 0$ D. $x^2 + y^2 - 4x + 2y - 5 = 0$

Answer: B

The standard equation of a circle is $(x - h)^2 + (y - k)^2 = r^2$. Substituting $h = 2$, $k = -1$, and $r = 3$ yields $(x - 2)^2 + (y + 1)^2 = 9$, which simplifies to $x^2 + y^2 - 4x + 2y - 4 = 0$.

5. Consider the ellipse given by the equation $4(x + 1)^2 + (y - 1)^2 = 16$. Which one of the following is the standard form of the equation of the ellipse? (1)

A. $\frac{(x+1)^2}{4^2} + \frac{(y-1)^2}{1^2} = 1$

B. $\frac{(x+1)^2}{4^2} + \frac{(y-1)^2}{4^2} = 1$

C. ✓ $\frac{(x+1)^2}{2^2} + \frac{(y-1)^2}{4^2} = 1$

D. $\frac{(x+1)^2}{2^2} + \frac{(y-1)^2}{1^2} = 1$

Answer: C

Dividing both sides of the equation $4(x + 1)^2 + (y - 1)^2 = 16$ by 16 gives $((x + 1)^2)/4 + ((y - 1)^2)/16 = 1$, which in standard form is $((x + 1)^2)/(2^2) + ((y - 1)^2)/(4^2) = 1$.

6. Which of the following is true? A hyperbola is a locus of points in the plane so that: (1)

A. the sum of the distances from two fixed points is constant

B. ✓ **the difference between the distances from two fixed points is constant**

C. the points have the same distance from a given point and a given line

D. the points have the same distance from any given two points

Answer: B

By definition, a hyperbola is the locus of all points in a plane such that the absolute difference of their distances from two fixed points (foci) is constant.

7. Which of the following is the converse of: "If wages increase, then inflation decreases."? (1)

A. ✓ **If inflation decreases, then wages increase**

B. If inflation decreases, then wages decrease

C. If inflation increases, then wages decrease

D. If inflation increases, then wages increase

Answer: A

The converse of a conditional statement 'If P, then Q' is 'If Q, then P'. Therefore, the converse of 'If wages increase, then inflation decreases' is 'If inflation decreases, then wages increase'.

8. Let $A = \begin{pmatrix} 0 & -1 \\ 5 & 1 \end{pmatrix}$ Which one of the following is equal to $A + A^T$? (1)

A. $\begin{pmatrix} 0 & -4 \\ -4 & 2 \end{pmatrix}$

B. ✓ $\begin{pmatrix} 0 & 4 \\ 4 & 2 \end{pmatrix}$

C. $\begin{pmatrix} 0 & 5 \\ 5 & 1 \end{pmatrix}$

D. $\begin{pmatrix} 0 & -5 \\ -5 & 1 \end{pmatrix}$

Answer: B

The transpose of A is $\begin{bmatrix} 0 & 5 \\ -1 & 1 \end{bmatrix}$. Adding A and its transpose element-wise gives $\begin{bmatrix} 0 & 4 \\ 4 & 2 \end{bmatrix}$.

9. Consider a line with equation $y = mx + b$. Which of the following is true? (1)

A. ✓ **The line intersects the y axis, if $m \neq 0$ and $b > 0$**

B. The line intersects the x axis, if $m = 0$ and $b > 0$

C. The line has no slope

D. The line passes through the origin

Answer: A

The line $y = mx + b$ always has a y-intercept at $(0, b)$ regardless of m , so if $m \neq 0$ and $b > 0$, it certainly intersects the y-axis at a positive value.

10. Which one of the following statements is NOT true about the graph of the given linear inequality? (1)
- A. ✓ **The graph of the linear inequality $y > 2x - 1$ contains all points of the line $y = 2x - 1$**
- B. The graph of the linear inequality $y \leq 2x + 1$ is below the line $y = x$ on the interval $(-\infty, -1)$
- C. The graph of the linear inequality $y > 2x + 1$ contains no points of the line $y = 2x - 3$
- D. The graph of the linear inequality $y \leq x - 1$ is above the line $y = 2x$ on the interval $(-\infty, -1)$

Answer: A

The strict inequality $y > 2x - 1$ means that points on the boundary line $y = 2x - 1$ itself are not included in the solution set. Therefore, statement A is false (NOT true).

11. Voter turnout in the local school board elections declined 40% from last year. This year only 3600 eligible voters went to the polls. How many people voted in last year's school board elections? (1)
- A. ✓ **6,000**
- B. 5,500
- C. 5,000
- D. 4,500

Answer: A

A decline of 40% means this year's turnout is 60% of last year's. Setting up the equation $0.60 * x = 3600$ gives $x = 6000$.

12. You happened to notice that the 8% sales tax that your father paid on the new Television Set came to Birr 3,800. How much did the Television Set cost him? (1)
- A. ✓ **Birr 47,500**
- B. Birr 45,800
- C. Birr 35,400
- D. Birr 30,600

Answer: A

The sales tax is 8% of the price of the TV, so $0.08 * \text{Cost} = 3800$. Solving for Cost gives $3800 / 0.08 = 47,500$ Birr.

13. Which one of the following numbers is equal to $\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$? (1)
- A. $6 + 2\sqrt{2}$
- B. ✓ **$5 + 2\sqrt{6}$**
- C. $1 + 2\sqrt{3}$
- D. $3 - 2\sqrt{3}$

Answer: B

Multiplying the numerator and the denominator by the conjugate $(\sqrt{3} + \sqrt{2})$ yields $((\sqrt{3} + \sqrt{2})^2) / (3 - 2) = 3 + 2\sqrt{6} + 2 = 5 + 2\sqrt{6}$.

14. What is the solution set of the equation $6 - 4x - 2x^2 = 0$? (1)
- A. $\{-6, 2\}$
- B. ✓ **$\{-3, 1\}$**
- C. $\{-1, 3\}$
- D. $\{1, 3\}$

Answer: B

Dividing $6 - 4x - 2x^2 = 0$ by -2 gives $x^2 + 2x - 3 = 0$, which factors into $(x + 3)(x - 1) = 0$, yielding solutions $x = -3$ and $x = 1$.

15. What is the area of an equilateral triangle inscribed in a circle of radius 4 units? (1)
- A. $6\sqrt{3}$ sq. units
- B. ✓ **$12\sqrt{3}$ sq. units**
- C. 12 sq. units
- D. 36 sq. units

Answer: B

An equilateral triangle inscribed in a circle of radius R has side length $s = R\sqrt{3}$. With $R = 4$, the side length is $4\sqrt{3}$, and its area is $(\sqrt{3} / 4) * s^2 = (\sqrt{3} / 4) * 48 = 12\sqrt{3}$ sq. units.

16. Consider $\triangle ABC$ with right angle at C and $m(\angle ABC) = 5^\circ$. If the length of $\overline{AC}$ is 10 units, then what is the area of the triangle? Given $\tan 35^\circ \approx 0.7$ and $\tan 5^\circ \approx 1.43$ (1)

- A. ✓ 35 sq. units
B. 70 sq. units
C. 5/149 sq. units
D. 10/149 sq. units

Answer: A

Due to a typo, the angle $m(\angle ABC)$ should be 55° (since $\tan 55^\circ \approx 1.43$). In right $\triangle ABC$, $BC = AC / \tan 55^\circ \approx 10 / 1.43 \approx 7$. Thus, the area is $0.5 * AC * BC \approx 0.5 * 10 * 7 = 35$ sq. units.

17. The base of a right prism is a rectangle with sides 3 cm and 4 cm and the altitude of the prism is 5 cm. What is the total surface area of the prism? (1)

- A. 70 cm²
B. 82 cm²
C. ✓ 94 cm²
D. 102 cm²

Answer: C

The total surface area of the right prism is $TSA = 2 * (\text{Base Area}) + (\text{Base Perimeter}) * \text{Height}$. Here, $TSA = 2 * (3 * 4) + (2 * (3 + 4)) * 5 = 24 + 70 = 94$ cm².

18. Consider the graphs of the functions $y = a^x$ and $y = \log_a x$ for $a > 0$ and $a \neq 1$. Which of the following is true about the functions? (1)

- A. The graph of $y = a^x$ is a reflection of the graph of $y = \log_a x$ about the origin.
B. The graph of $y = a^x$ is a reflection of the graph of $y = \log_a x$ along $y = -x$.
C. ✓ For $a > 1$, the graphs of both $y = a^x$ and $y = \log_a x$ are increasing on $(0, \infty)$.
D. For $0 < a < 1$, the y-axis is an asymptote of to the graphs of $y = a^x$ and $y = \log_a x$.

Answer: C

For base $a > 1$, both the exponential function $y = a^x$ and the logarithmic function $y = \log_a x$ are strictly increasing on their respective domains, meaning both are increasing on the interval $(0, \infty)$. Options A and B are incorrect because the functions are reflections of each other across the line $y = x$ (not the origin or $y = -x$), and option D is incorrect because the horizontal asymptote of $y = a^x$ is the x-axis, not the y-axis.

19. What is the solution set of the equation $3^{(x-x^2)} = \frac{1}{9}$? (1)

- A. {0, 1}
B. {-1, 0}
C. {1, -2}
D. ✓ {-1, 2}

Answer: D

By writing $1/9$ as 3^{-2} , we obtain the equation $x - x^2 = -2$, which simplifies to $x^2 - x - 2 = 0$. Solving this quadratic equation gives the solution set $\{-1, 2\}$.

20. Which of the following is true about the trigonometric values of 855° ? (1)

- A. ✓ $\cos 855^\circ = -\frac{\sqrt{2}}{2}$
B. $\sin 855^\circ = \frac{\sqrt{3}}{2}$
C. $\tan 855^\circ = 1$
D. $\cot 855^\circ = -\sqrt{2}$

Answer: A

The angle 855° is coterminal with 135° ($855^\circ - 2 * 360^\circ = 135^\circ$), which lies in the second quadrant where cosine is negative. Therefore, $\cos 855^\circ = \cos 135^\circ = -\cos 45^\circ = -\text{sqrt}(2)/2$.

21. Which one of the following is true about the function $y = \sin x$? (1)
- A. Its domain is $[-1, 1]$ B. Its period is π
C. ✓ **Its range is $[-1, 1]$** D. Its domain is $(0, \infty)$

Answer: C

The sine function, $y = \sin x$, has a domain of all real numbers, a period of 2π , and a range of $[-1, 1]$.

22. Let $f(x) = \frac{3x+1}{x+2}$. Which one of the following is the inverse of f ? (1)
- A. $f^{-1}(x) = \frac{2x-1}{x-3}$ B. ✓ $f^{-1}(x) = \frac{-2x+1}{x-3}$
C. $f^{-1}(x) = \frac{x-2}{-3x-1}$ D. $f^{-1}(x) = \frac{x+2}{3x+1}$

Answer: B

To find the inverse of $f(x) = (3x + 1)/(x + 2)$, set $y = (3x + 1)/(x + 2)$ and solve for x : $y(x + 2) = 3x + 1$, which gives $x(y - 3) = 1 - 2y$, or $x = (-2y + 1)/(y - 3)$. Thus, $f^{-1}(x) = (-2x + 1)/(x - 3)$.

23. Consider the rational function $f(x) = \frac{x^3-1}{x^2+1}$. Which one of the following is true about the graph of f ? (1)
- A. ✓ **Its y-intercept is -1** B. It has no x-intercept
C. It is symmetrical about the y-axis D. It is symmetrical about the origin

Answer: A

To find the y-intercept, evaluate $f(0) = (0^3 - 1)/(0^2 + 1) = -1$. This means the graph of f intersects the y-axis at $(0, -1)$.

24. If two cards are drawn one after the other from a well shuffled pack of cards, then which one of the following is an independent event? (1)
- A. Drawing a king in the first draw and a queen in the second draw without replacing the first.
B. ✓ **Drawing a king in the first draw and a queen in the second draw by replacing the first.**
C. Drawing kings in both draws without replacing the first.
D. Draw queens in both draws without replacing the first.

Answer: B

Two events are independent if the outcome of the first does not affect the probability of the second. This occurs when sampling is done with replacement, as in option B.

25. A bag contains 2 red, 3 white and 1 black balls. We draw two balls one after the other without replacement. What is the probability that the first ball is red and the second ball is black? (1)
- A. $1/10$ B. $1/12$
C. ✓ **$1/15$** D. $1/18$

Answer: C

The probability of drawing a red ball first is $2/6 = 1/3$. Without replacement, 5 balls remain, of which 1 is black, so the probability of then drawing a black ball is $1/5$. The combined probability is $(1/3) * (1/5) = 1/15$.

26. Consider the grouped frequency table for students' weight in a certain school. Weight (kg) Frequency
31 – 35 3
36 – 40 5
41 – 45 6
46 – 50 7
51 – 55 4
What is the mean weight of the student? (1)
- A. 41.5kg B. 43kg
C. ✓ **43.8kg** D. 45.5kg

Answer: C

Using the class marks (33, 38, 43, 48, 53) and their respective frequencies, the sum of $f * x$ is $99 + 190 + 258 + 336 + 212 = 1095$. Dividing this by the total frequency of 25 yields a mean of 43.8 kg.

27. Which of the following is NOT true?

(1)

- A. There is no single rule for determining the size of a sample.
- B. Random sampling requires time to plan and implement.
- C. Random sampling is free from personal bias of the investigator.
- D. ✓ **Any person can implement random sampling from a given population.**

Answer: D

Random sampling cannot be properly designed and implemented by just any person without a defined sampling frame and training in probability sampling techniques.

28. One special perfume costs a cosmetic shop Birr 2,100. If the shop desires a 25% markup rate based on the selling price, then which one of the following should be set as a selling price for this perfume?

(1)

- A. ✓ **Birr 2,800**
- B. Birr 2,600
- C. Birr 2,400
- D. Birr 2,300

Answer: A

Let S be the selling price. Since the markup rate is 25% based on selling price, $S - 2100 = 0.25S$, which simplifies to $0.75S = 2100$, giving $S = 2800$.

29. Let f be a function defined on an open interval about a real number a , except possibly at a itself. Which one of the following is necessary for $\lim_{x \rightarrow a} f(x)$ to exist?

(1)

- A. ✓ **$\lim_{x \rightarrow a} f(x) = \lim_{x \rightarrow a} f(x)$**
- B. $\lim_{x \rightarrow a} f(x) = f(a)$
- C. $\lim_{x \rightarrow a} f(x)$ exists
- D. $\lim_{x \rightarrow a} f(x)$ exists

Answer: A

A fundamental theorem of limits states that the limit of a function $f(x)$ as x approaches a exists if and only if both the left-hand and right-hand limits exist and are equal.

30. Consider two firms with the given mean income and standard deviations. Firm Mean income (in Bir) Standard deviation (in Bir) Firm I 1,500,000 300 Firm II 1,500,000 350 which one of the following is True

(1)

- A. The data set in Firm I have greater variability than Firm II.
- B. ✓ **The data set in Firm I have less variability than Firm II.**
- C. The two data sets have the same consistency.
- D. We cannot compare the two data sets.

Answer: B

Since both firms have the same mean income, the firm with the smaller standard deviation (Firm I, with $SD = 300$ vs Firm II, with $SD = 350$) has less variability and is more consistent.

31. Let f be a function that is continuous at x_0 . Which of the following is true about f ?

(1)

- A. x_0 does not belong to the domain of f .
- B. $\lim_{x \rightarrow x_0} f(x)$ does not exist.
- C. $\lim_{x \rightarrow x_0} f(x) \neq f(x_0)$
- D. ✓ **$\lim_{x \rightarrow x_0} f(x) = f(x_0)$**

Answer: D

By definition, a function f is continuous at x_0 if the limit as x approaches x_0 of $f(x)$ exists and is equal to the function value $f(x_0)$. (Option D contains a minor typographical omission of the variable x in the limit).

32. Let $f(x) = 2\sqrt{x+1}$. Which one of the following indicates the interval and its derivative of f respectively? (1)
- A. $[0, \infty)$, $(x+1)^{\frac{3}{2}}$ B. $[-1, \infty)$, $\frac{1}{\sqrt{x+1}}$
 C. $\checkmark (-1, \infty)$, $\frac{1}{\sqrt{x+1}}$ D. $(-\infty, -1)$, $(x+1)^{-\frac{3}{2}}$

Answer: C

The derivative of $f(x)$ is $f'(x) = 1/\sqrt{x+1}$, which is defined only on the open interval $(-1, \infty)$, where the denominator is positive and non-zero.

33. Let $f(x) = x^2 + \sqrt{x}$ and $g(x) = e^{2x}$. Which of the following is true? (1)
- A. $\checkmark (f+g)'(x) = 2x + \frac{1}{2\sqrt{x}} + 2e^{2x}$ B. $(f+g)'(x) = 2x + \frac{1}{2} \cdot \sqrt{x} + 2e^{2x}$
 C. $(f+g)'(x) = 2x - \frac{1}{2} \cdot \sqrt{x} - 2e^{2x}$ D. $(f+g)'(x) = 2x - \frac{1}{2\sqrt{x}} - 2e^{2x}$

Answer: A

Using the sum rule and individual derivative rules, $(f+g)'(x) = d/dx(x^2) + d/dx(x^{1/2}) + d/dx(e^{2x}) = 2x + 1/(2\sqrt{x}) + 2e^{2x}$.

34. What is the equation of the tangent line to the graph of the function $f(x) = e^x$ at $(1, e)$? (1)
- A. $y = x + \frac{1}{e}$ B. $y = \frac{1}{e}x + \frac{1}{e}$
 C. $y = ex + e$ D. $\checkmark y = ex$

Answer: D

The derivative of $f(x) = e^x$ is $f'(x) = e^x$, so the slope at $x = 1$ is e . The equation of the tangent line is $y - e = e(x - 1)$, which simplifies directly to $y = ex$.

35. Water is flowing in this a cylindrical water tank of radius 2 m and height 10 m at a rate of $5 \text{ cm}^3/\text{min}$. What is the rate of the change of the height when the water level is 6 m? (1)
- A. $\checkmark 5/4\pi \text{ m/min}$ B. $5\pi/2 \text{ m/min}$
 C. 2 m/min D. $2\pi \text{ m/min}$

Answer: A

The volume of water is $V = \pi r^2 h = 4\pi h$. Differentiating with respect to time gives $dV/dt = 4\pi dh/dt$, so $5 = 4\pi dh/dt$, which yields $dh/dt = 5/(4\pi) \text{ m/min}$.

36. Which one of the following is equal to $\int (e^{2x} + \cos x) dx$? (1)
- A. $\checkmark \frac{1}{2}e^{2x} + \sin x + C$ B. $\frac{1}{2}e^{2x} - \sin x + C$
 C. $e^{2x} + \cos x + C$ D. $e^{2x} + \sin x + C$

Answer: A

Integrating term-by-term using the rules $\int e^{ax} dx = (1/a) e^{ax} + C$ and $\int \cos x dx = \sin x + C$ gives $\frac{1}{2} e^{2x} + \sin x + C$.

37. Which one of the following is equal to $\int_1^3 2x\sqrt{x^2+1} dx$? (1)
- A. $\frac{4(10\sqrt{10}-2\sqrt{2})}{3}$ B. $\frac{2(5\sqrt{10}-\sqrt{2})}{3}$
 C. $\frac{2(5\sqrt{10}+2\sqrt{2})}{3}$ D. $\checkmark \frac{4(5\sqrt{10}-\sqrt{2})}{3}$

Answer: D

Using substitution with $u = x^2 + 1$ and $du = 2x dx$, the limits change to 2 and 10, giving $\int_2^{10} u^{1/2} du = \frac{2}{3} (10^{3/2} - 2^{3/2}) = \frac{4}{3} (5\sqrt{10} - \sqrt{2})$.

Solving the system by elimination, multiplying the first equation by 5 and the second by 2 gives $13y = -29 \Rightarrow y = -29/13$. Substituting this into $2x + 7y = -5$ yields $x = 69/13$.

44. What is the simplified form of $\frac{(2+i)(3-4i)}{(2-2i)(1+i)}$? (1)

- A. $\frac{7}{8} - \frac{3}{8}i$
C. $\frac{5}{2} + \frac{5}{4}i$

- B. $\frac{5}{2} - \frac{5}{2}i$
D. $\frac{5}{2} - \frac{5}{4}i$

Answer: D

The numerator simplifies to $(2+i)(3-4i) = 10 - 5i$ and the denominator to $(2-2i)(1+i) = 4$. Thus, the expression equals $\frac{10-5i}{4} = \frac{5}{2} - \frac{5}{4}i$.

45. Consider the sequence $(1 + \frac{1}{n})_{n=1}^{\infty}$. Which one of the following is true about the sequence? (1)

A. 2 is its lower bound

B. $3/2$ is its lower bound

C. **✓ 4 is its upper bound**

D. $6/5$ is its upper bound

Answer: C

The terms of the sequence $(1 + 1/n)$ are bounded within the interval $(1, 2]$. Since 2 is the least upper bound, any number greater than or equal to 2, such as 4, is an upper bound of the sequence.

46. Which one of the following is equal to (1)

$$\lim_{x \rightarrow 0} \frac{x}{1 - \sqrt{x+1}}$$

A. 0

B. **✓ -2**

C. -1

D. $-1/2$

Answer: B

Multiplying the numerator and the denominator by the conjugate $1 + \sqrt{x+1}$ simplifies the limit to $\lim_{x \rightarrow 0} -(1 + \sqrt{x+1}) = -2$.

47. Consider the function $f(x) = x^2 - 3x$ on $[-1, 2]$. What is the value x that satisfies the Mean Value Theorem? (1)

A. 0

B. 1

C. **✓ $1/2$**

D. $3/2$

Answer: C

By the Mean Value Theorem, $f'(c) = \frac{f(2)-f(-1)}{2-(-1)} = \frac{-2-4}{3} = -2$. Solving $f'(c) = 2c - 3 = -2$ gives $c = 1/2$, which lies in $(-1, 2)$.

48. A carpenter wants to design a closed box that has a square base and total surface area of 54 cm^2 . What is the maximum volume that can be constructed with the given total surface area? (1)

A. 12 cm^3

B. 13.5 cm^3

C. 18 cm^3

D. **✓ 27 cm^3**

Answer: D

With a square base of side x and height h , the area is $2x^2 + 4xh = 54$, which gives $h = \frac{27-x^2}{2x}$. The volume is $V(x) = \frac{1}{2}(27x - x^3)$, which is maximized when $V'(x) = 0 \Rightarrow x = 3$, giving a maximum volume of 27 cm^3 .

49. What is the area of the region bounded by the line $y = x$ and the parabola $y = x^2 - 2x$ on the interval $[0, 3]$? (1)

A. 9 square units

B. **✓ $9/2$ square units**

C. 3 square units

D. 2 square units

Answer: B

The line $y = x$ and parabola $y = x^2 - 2x$ intersect at $x = 0$ and $x = 3$, where $y = x \geq y = x^2 - 2x$. The area is $\int_0^3 (3x - x^2) dx = [\frac{3}{2}x^2 - \frac{1}{3}x^3]_0^3 = \frac{27}{2} - 9 = 9/2$.

50. A painter buys 5 liters of paint for Birr 36 and 6 liters of the same brand paint for Birr 43. Which of the following is true? (1)
- A. Buying 5 liters is more economical than buying 6 liters.
 - B. ✓ **Buying 6 liters is more economical than buying 5 liters.**
 - C. Both have the same economical purchase.
 - D. We cannot compare.

Answer: B

The unit price of the 5-liter option is $36/5 = 7.2$ Birr/liter, whereas the unit price of the 6-liter option is $43/6 \approx 7.17$ Birr/liter. Since the unit price of the 6-liter option is lower, it is more economical.

END OF THE MARKING KEY

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