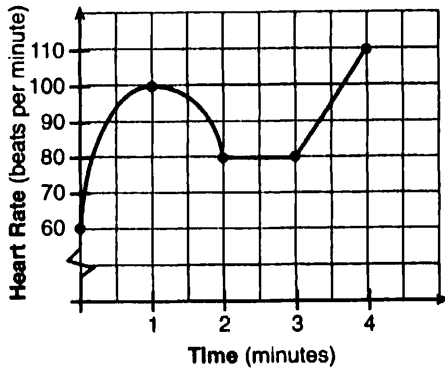


MATHEMATICS B—JUNE 2005 (1)

Part I

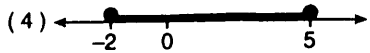
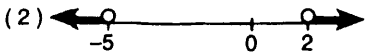
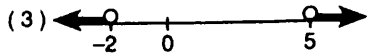
Answer all questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. For each question, write on the separate answer sheet the numeral preceding the word or expression that best completes the statement or answers the question. [40]

1. The accompanying graph shows the heart rate, in beats per minute, of a jogger during a 4-minute interval.



What is the range of the jogger's heart rate during this interval?

- (1) 0–4 (2) 1–4 (3) 0–110 (4) 60–110
2. If $\sin \theta$ is negative and $\cos \theta$ is negative, in which quadrant does the terminal side of θ lie?
 (1) I (2) II (3) III (4) IV
3. Expressed as a function of a positive acute angle, $\sin(-230^\circ)$ is equal to
 (1) $\sin 50^\circ$ (2) $-\sin 50^\circ$ (3) $\cos 50^\circ$ (4) $-\cos 50^\circ$
4. Written in simplest form, the expression $\frac{x^2 - 9x}{45x - 5x^2}$ is equivalent to
 (1) $\frac{1}{5}$ (2) $-\frac{1}{5}$ (3) 5 (4) -5
5. Which graph represents the solution set for the expression $|2x + 3| > 7$?



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6. What are the coordinates of the center of the circle represented by the equation $(x + 3)^2 + (y - 4)^2 = 25$?
 (1) (3, 4) (2) (3, -4) (3) (-3, 4) (4) (-3, -4)

7. What is the mean of the data in the accompanying table?

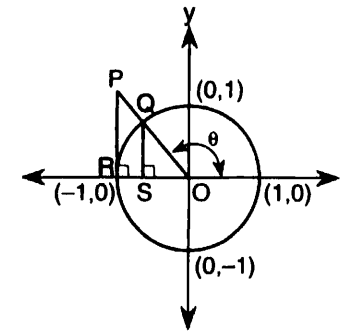
Scores (x_i)	Frequency (f_i)
25	3
20	2
11	5
10	4

- (1) 11 (2) 14.5 (3) 15 (4) 16
8. In a given rectangle, the length varies inversely as the width. If the length is doubled, the width will
 (1) be divided by 2 (2) remain the same (3) be multiplied by 2 (4) increase by 2
9. Impedance measures the opposition of an electrical circuit to the flow of electricity. The total impedance in a particular circuit is given by the formula $Z_T = \frac{Z_1 Z_2}{Z_1 + Z_2}$. What is the total impedance of a circuit, Z_T , if $Z_1 = 1 + 2i$ and $Z_2 = 1 - 2i$?

- (1) 1 (2) 0 (3) $\frac{5}{2}$ (4) $-\frac{3}{2}$
10. If $\log a = x$ and $\log b = y$, what is $\log a\sqrt{b}$?
 (1) $x + 2y$ (2) $2x + 2y$ (3) $\frac{x + y}{2}$ (4) $x + \frac{y}{2}$
11. Which relation is a function?
 (1) $xy = 7$ (2) $x = 7$ (3) $x^2 - y^2 = 7$ (4) $x^2 + y^2 = 7$
12. Which equation, when graphed on a Cartesian coordinate plane, would best represent an elliptical racetrack?
 (1) $3x^2 + 10y^2 = 288,000$ (3) $3x + 10y = 288,000$
 (2) $3x^2 - 10y^2 = 288,000$ (4) $30xy = 288,000$
13. The expression $\frac{2 + i}{3 + i}$ is equivalent to
 (1) $\frac{6 + 5i}{8}$ (2) $\frac{6 + i}{8}$ (3) $\frac{7 - 5i}{10}$ (4) $\frac{7 + i}{10}$

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14. For which quadratic equation is the axis of symmetry $x = 3$?
 (1) $y = -x^2 + 3x + 5$ (2) $y = -x^2 + 6x + 2$ (3) $y = x^2 + 6x + 3$ (4) $y = x^2 + x + 3$
15. A crate weighing w pounds sits on a ramp positioned at an angle of θ with the horizontal. The forces acting on this crate are modeled by the equation $Mw \cos \theta = w \sin \theta$, where M is the coefficient of friction. What is an expression for M in terms of θ ?
 (1) $M = \tan \theta$ (2) $M = \cot \theta$ (3) $M = \sec \theta$ (4) $M = \csc \theta$
16. If $(a^x)^{\frac{2}{3}} = \frac{1}{a^2}$, what is the value of x ?
 (1) 1 (2) 2 (3) -3 (4) -1
17. What is the third term in the expansion of $(\cos x + 3)^5$?
 (1) $90 \cos^2 x$ (2) $270 \cos^2 x$ (3) $60 \cos^3 x$ (4) $90 \cos^3 x$
18. Which equation has imaginary roots?
 (1) $x(5 + x) = 8$ (2) $x(5 - x) = -3$ (3) $x(x + 6) = -10$ (4) $(2x + 1)(x - 3) = 7$
19. The graphs of the equations $y = 2^x$ and $y = -2x + a$ intersect in Quadrant I for which values of a ?
 (1) $0 < a < 1$ (2) $a < 1$ (3) $a \geq 1$ (4) $a > 1$
20. In the accompanying diagram, \overline{PR} is tangent to circle O at R , $\overline{QS} \perp \overline{OR}$, and $\overline{PR} \perp \overline{OR}$.



- Which measure represents $\sin \theta$?
 (1) SO (2) RO (3) PR (4) QS