MATHEMATICS 1115A 2005 AUTUMN TEST 2

SECTION _____ NAME (PRINTED) _____

Student Number _____ SIGNATURE _____

Only calculators without memory or graphics are allowed and no other electronic devices are allowed. **Each multiple choice question is worth 1 mark. All work is to be shown on the attached question paper in the space provided and *the answer selected must be entered on this answer sheet.* Both the question paper and the answer sheet, *both* with completed identification sections, must be handed in.**

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A lecture hall has five doors for student access.

1. The number of ways that a student can enter the hall by one door and exit by another is:

   (A) 10 (B) $C(5,2)$ (C) 20 (D) $P(5,4)$ (E) 25

2. The number of ways that a student can enter the hall by one door and exit by any door is:

   (A) 25 (B) 20 (C) 10 (D) 120 (E) 2

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3. The number of distinguishable permutations of the letters of the word ALABAMA is:

   (A) $\dfrac{7!}{4! \cdot 3!}$ (B) $C(7,4)$ (C) $C(7,3)$ (D) $7!$ (E) $\dfrac{7!}{4! \cdot 1! \cdot 1! \cdot 1!}$

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4. An experiment consists of pulling 4 rabbits, in succession, without replacement, from a hat containing 9 distinguishable rabbits. The number of elements in the sample space for this experiment is:

   (A) 9^4 (B) $C(9,4)$ (C) 4 (D) 9 (E) $9 \cdot 8 \cdot 7 \cdot 6$

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5. If $P(E) = \dfrac{1}{2}$, $P(E \cup F) = \dfrac{13}{20}$, and $P(E \cap F) = \dfrac{1}{10}$ then $P(F) =$

   (A) $\dfrac{1}{5}$ (B) none of these (C) $\dfrac{1}{2}$ (D) $\dfrac{1}{3}$ (E) $\dfrac{1}{6}$

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6. Three fair, distinguishable, coins are tossed. The probaility that exactly one tail shows is:

(A) $\frac{1}{8}$ (B) $\frac{1}{2}$ (C) $\frac{7}{8}$ (D) $\frac{3}{8}$ (E) none of these

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7. If $P(E) = \frac{1}{4}$, $P(F) = \frac{1}{3}$, and $P(E|F) = \frac{3}{4}$ then $P(E \cup F) =$

(A) $\frac{1}{5}$ (B) $\frac{4}{7}$ (C) $\frac{1}{4}$ (D) $\frac{1}{3}$ (E) $\frac{7}{12}$

An automobile manufacturer has four plants: A,B,C, and D. The percentages of total daily output produced by the four plants are 35%, 20%, 30%, and 15% respectively. The percentages of defective units produceed by the plants are 2%, 5%, 3%, and 4% respectively. A car on a dealer's lot is selected randomly.

8. The probability that the defective car came from line A is:

(A) $\frac{35}{64}$ (B) $\frac{7}{32}$ (C) 70% (D) 7% (E) $\frac{7}{1000}$

9. The probability that the defective car came from line B is:

(A) 10% (B) $\frac{10}{32}$ (C) 1% (D) $\frac{9}{16}$ (E) $\frac{4}{100}$

In a 1990 survey of smokers, 75% predicted that they would still be smoking five years later. Their only other option in the survey was to predict that they would not be smoking five years later. Five years later, 70% of those who predicted they would still be smoking did not smoke, and of those who predicted they would not be smoking, 90% did not smoke.

10. The probability that a person predicted they would not be smoking 5 years later was:

    (A) 30% (B) 70% (C) 90% (D) 10% (E) 25%

11. The probability that a person who does not smoke predicted five years earlier that they would still be smoking is:

    (A) $\frac{7}{10}$ (B) $\frac{75}{100}$ (C) $\frac{9}{10}$ (D) $\frac{95}{100}$ (E) $\frac{3}{10}$

A fast-food chain estimates that if it opens a restaurant in a shopping centre then the probability that the restaurant is successful is 0.65. A successful restaurant earns an annual profit of $75,000; a restaurant that is not successful loses $20,000.

12. If X denotes the gain (in dollars) to the chain of a restaurant in a shopping centre then X takes on the values:

    (A) $75,000$, 0.65, $20,000$, and 0.35 (B) $75,000$ and $20,000$ (C) $75,000$ and $-20,000$
    (D) $75,000$, 0.80, $20,000$, and 0.25 (E) none of these

13. The expected gain to the chain from opening a restaurant in a shopping centre is:

    (A) $75,000(0.65) + (20,000)(0.35)$ (B) $75,000(0.65)$ (C) $75,000(0.65) + (-20,000)(0.35)$
    (D) $-75,000(0.65) + (20,000)(0.35)$ (E) none of these

14. From a deck of 52 playing cards, 3 cards are randomly selected, in succession with replacement. The probability that exactly two cards are aces is:

(A) $C(3,2)\left(\frac{1}{13}\right)^2\left(\frac{12}{13}\right)^1$ (B) $P(3,2)\left(\frac{1}{13}\right)^2\left(\frac{12}{13}\right)^1$ (C) $C(52,3)\left(\frac{1}{13}\right)^2\left(\frac{12}{13}\right)^1$
(D) $C(52,4)\left(\frac{1}{13}\right)^2\left(\frac{12}{13}\right)^1$ (E) $)\left(\frac{1}{13}\right)^2$

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15. If $f(x) = x^2 + x + 1$ then $\lim_{h\to 0} \frac{f(x+h) - f(x)}{h} =$

(A) $\frac{0}{0}$ (B) $2x$ (C) $3x$ (D) $2x + 1$ (E) ∞

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16. The annual rate r which componded continuously is equivalent to a nominal rate of 6% compounded semiannually is:

(A) $(\ln(1.03))^2$ (B) $\ln(1.06)$ (C) $\frac{1}{2}\ln(1.06)$ (D) $2\ln(1.03)$ (E) $\ln((1.03)^{\frac{1}{2}})$

The next two questions concern $f(x) = 2 - 3x^2$

17. The slope of the curve at the point $(a, 2 - 3a^2)$ is:

(A) $-6a$ (B) $2 - 6a$ (C) $2 - 3a^2$ (D) 2 (E) $1 - 6a$

18. The point $(1, -1)$ is on the curve. The tangent line at this point is:

(A) $y - 1 = -6(x + 1)$ (B) $y + 1 = 2(x - 1)$ (C) $y + 1 = -6(x - 1)$ (D) $y + 1 = -4(x - 1)$
(E) $y + 1 = -5(x - 1)$

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19. If $f(x) = x^{21}$ then $f'(x) =$

(A) 21 (B) x^{20} (C) $21x^{-20}$ (D) $21x^{22}$ (E) $21x^{20}$

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20. If $f(x) = 4x^3$ then $f'(x) =$

(A) $4x^2$ (B) $12x^2$ (C) $3x^2$ (D) $7x^2$ (E) $12x^4$

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21. If cost c is given as a function of quantity q by $c = 0.04q^3 - 0.5q^2 + 4.4q + 7500$ then the marginal cost is given by:

(A) $0.04q^4 - 0.5q^3 + 4.4q^2 + 7500q$ (B) $3q^2 - 10q + 4.4 + 7500$ (C) $0.012q^2 - 0.10q + 4.4$ (D) $0.04q^2 - 0.5q + 4.4 + \dfrac{7500}{q}$ (E) $0.12q^2 - q + 4.4$

22. The cost of producing the 11th item can be approximated by evaluating the marginal cost at $q = 10$ yielding:

(A) 7594.4 (B) 4.6 (C) 6.4 (D) 10 (E) 100

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23. The derivative of $(3x-1)(7x+2)$ is

(A) $(3x-1)(7)+(3)(7x+2)$ (B) $(3x-1)(7)-(3)(7x+2)$ (C) 21
(D) $\dfrac{(3x-1)(7)-(3)(7x+2)}{x^2}$ (E) none of these

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24. If national consumption C as a function of national income I is given by $C = 0.712I + 95.05$ then the marginal propensity to consume is

(A) $0.712I$ (B) 95 (C) 95.05 (D) 0.712 (E) 712

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25. If $y = (x^2-4)^4$ then $\dfrac{dy}{dx} =$

(A) $4(2x)^3$ (B) $4(x^2-4)^3(2x)$ (C) $4(x^2-4)^3 2(2x)$ (D) $4(x^2-4)^3+(2x)$
(E) $(x^2-4)^4(x^3-4x)$
