Name:________________________________

								$Math - 132$ $Term - 093$ $SUMTW$ $10:30\ am$	$Section$ 01 $11:30\ am$

$CODE$ $001*$	$CODE$ 002	$CODE$ 003	$CODE$ 004	$MARKS: 175$ $Time: 3Hours$	$SERIAL$ $Number$		

NOTE: 1. The questions are not in any order of difficulty at all.

2. All questions carry equal number of marks.

3. Only the nonprogramable calculators are allowed.

4. All types of PAGERS, OR MOBILES ARE NOT ALLOWED to be with you during the examination.

5. Use an HB 2 pencil.

6. Use a good eraser. Do not use the eraser attached to the pencil.

7. Write your name, ID number and Section number on the examination paper and in the upper left corner of the answer sheet.

8. When bubbling your ID number and Section number, be sure that bubbles match with the number that you write.

9. The test Code Number is already typed and bubbled in your answer sheet. Make sure that it is the same as that printed on your question paper.

10. When bubbling, make sure that the bubbled space is fully covered.

11. When erasing a bubble, make sure that you do not leave any trace of penciling.

12. Count that the Examination has THIRTY-FIVE Questions and TWENTY-TWO Pages.

13. Please BUBBLE carefully only right answer letter $(A$ or B or C or D or $E)$ corresponding to the correct answer to each question in the enclosed computerized Omar Sheet, with pencil only.

14. Please do not leave any question unbubbled in the Answer Sheet.

15. Please check that the version of your question paper and the answer sheet enclosed with it matches correctly. The versions are Code: 001, Code: 002, Code: 003, Code: 004.

1Q1. Find the Limit if it exists.

$$\lim_{x \longrightarrow 0} \left[\frac{\left(\frac{1}{x+3} - \frac{1}{3} \right)}{x} \right].$$

$(A) \longrightarrow \frac{1}{3}$

$(B) \longrightarrow -\frac{1}{3}$

$(C) \longrightarrow -\frac{1}{9}$

$(D) \longrightarrow 0$

$(E) \longrightarrow$ *Does Not Exist.*

==

2Q2. Find the value of the constant K that makes the function $f(x)$ to be continuous.

$$f(x) = \begin{cases} \frac{3x^2 + 2x - 8}{x+2} & if \quad x \neq -2 \\ 3x + K & if \quad x = -2 \end{cases}$$

$(A) \longrightarrow 0$

$(B) \longrightarrow -4$

$(C) \longrightarrow -3$

$(D) \longrightarrow 5$

$(E) \longrightarrow 6$

==

3Q3. Assume the total revenue from the sale of x items is given by

$R(x) = 31 \ln |x + 1|,$

while the total cost to produce x items is

$C(x) = \frac{x}{5}.$

Find the appropriate number of items that should be manufactured so that profit,

$P(x) = R(x) - C(x),$

is maximum.

$(A) \longrightarrow 95 \; items$

$(B) \longrightarrow 154 \; items$

$(C) \longrightarrow 36 \; items$

$(D) \longrightarrow 6 \; items$

$(E) \longrightarrow 155 \; items$

==

4Q4. Let $y = \frac{(x^2+2)(x^3-6)}{(x+9)}$
$= \frac{x^5 + 2x^3 - 6x^2 - 12}{(x+9)}$.
Find the derivative $\frac{dy}{dx}$.

$(A) \longrightarrow \frac{4x^5 + 45x^4 + 4x^3 + 48x^2 - 108x + 12}{(x+9)^2}$

$(B) \longrightarrow -\frac{3x^7 + 54x^6 - 4x^5 - 18x^4 - 324x^3 + 36x^2}{(x+9)^2}$

$(C) \longrightarrow \dfrac{3x^7 + 54x^6 - 4x^5 - 18x^4 - 324x^3 + 36x^2}{(x+9)^2}$

$(D) \longrightarrow -\dfrac{4x^5 + 45x^4 + 4x^3 + 48x^2 - 108x + 12}{(x+9)^2}$

$(E) \longrightarrow \dfrac{5x^4 + 6x^2 - 12x}{(x+9)^2}$

==

5Q5. The second derivative of a person's body temperature, with respect to the dosage of x milligrams of a drug, is given by

$\dfrac{d}{dx}[D(x)] = D'(x) = \dfrac{6}{x+2}.$

One milligram raises the temperature 2.4° C.

Find the function $D(x)$ giving the total change in temperature as a function of x.

$(A) \longrightarrow D(x) = \ln\left|\dfrac{6}{x+2}\right| - 2.4$

$(B) \longrightarrow D(x) = 6\ln|x+2| - 4.2$

$(C) \longrightarrow D(x) = 6\ln|x+2| + 2.4$

$(D) \longrightarrow D(x) = \ln\left|\dfrac{6}{x+2}\right| + 4.2$

$(E) \longrightarrow D(x) = \ln\left|\dfrac{x+2}{6}\right| + 3.3$

==

6Q6. If $f(x) = \begin{cases} \ln x & for \quad 0 < x \leq 2 \\ x^2 \ln 2 & for \quad 2 < x \leq 4, \end{cases}$

then $\underset{x \longrightarrow 2}{Lim} f(x)$ is

$(A) \longrightarrow \ln 2$

$(B) \longrightarrow \ln 8$

$(C) \longrightarrow \ln 16$

$(D) \longrightarrow 4$

$(E) \longrightarrow nonexistent \ (Does\ not\ exist.)$

==

7Q7. $\underset{h \longrightarrow 0}{Lim} \dfrac{\ln(e+h) - 1}{h}$ is

$(A) \longrightarrow f'(e), \ where \ f(x) = \ln x.$

$(B) \longrightarrow f'(e), \ where \ f(x) = \dfrac{\ln x}{x}.$

$(C) \longrightarrow f'(1), \ where \ f(x) = \ln x.$

$(D) \longrightarrow f'(1), \ where \ f(x) = \ln(x+e).$

$(E) \longrightarrow f'(e), \ where \ f(x) = \ln(x+e).$

==

8Q8. If $f(x) = \sin(e^{-x})$,

then $f'(x) = \dfrac{d}{dx}[f(x)] =$

$(A) \longrightarrow -\cos(e^{-x})$

$(B) \longrightarrow \cos(e^{-x}) + e^{-x}$

$(C) \longrightarrow \cos(e^{-x}) - e^{-x}$

$(D) \longrightarrow e^{-x}\cos(e^{-x})$

$(E) \longrightarrow -e^{-x}\cos(e^{-x})$

===

9Q9. Let $F(x) = \displaystyle\int \frac{(\ln x)^3}{x} dx$

be an antiderivative of $\dfrac{(\ln x)^3}{x}$.

If $F(1) = 0$, then $F(9) =$

$(A) \longrightarrow 0.048$

$(B) \longrightarrow 0.144$

$(C) \longrightarrow 5.827$

$(D) \longrightarrow 23.308$

$(E) \longrightarrow 1640.250$

===

10Q10. If g is a differentiable function such that $g(x) < 0$ for all real numbers x and if $f'(x) = (x^2 - 4)\, g(x)$, which of the following is true?

$(A) \longrightarrow$ f *has a relative maximum at* $x = -2$ *and a relative minimum at* $x = 2$.

$(B) \longrightarrow$ f *has a relative minimum at* $x = -2$ *and a relative maximum at* $x = 2$.

$(C) \longrightarrow$ f *has relative minima at* $x = -2$ *and at* $x = 2$.

$(D) \longrightarrow$ f *has relative maxima at* $x = -2$ *and at* $x = 2$.

$(E) \longrightarrow$ *It cannot be determined if* f *has any relative extrema.*

==

11Q11. The slope of the line tangent to the curve

$y^2 + (xy + 1)^3 = 0$ at $(2, -1)$ is

$(A) \longrightarrow -\dfrac{3}{4}$

$(B) \longrightarrow -\dfrac{3}{2}$

$(C) \longrightarrow 0$

$(D) \longrightarrow \dfrac{3}{4}$

$(E) \longrightarrow \dfrac{3}{2}$

==

12Q12. What is the minimum value of $f(x) = x \ln x$?

$(A) \longrightarrow -e$

$(B) \longrightarrow -1$

$(C) \longrightarrow -\dfrac{1}{e}$

$(D) \longrightarrow 0$

$(E) \longrightarrow f(x)\ has\ no\ \min imum\ value.$

==

13Q13. $\displaystyle\int_0^1 x^3 e^{x^4} dx =$

$(A) \longrightarrow \dfrac{1}{4}(e-1)$

$(B) \longrightarrow \dfrac{1}{4}e$

$(C) \longrightarrow e-1$

$(D) \longrightarrow e$

$(E) \longrightarrow 4(e-1)$

==

14Q14. If $f(x) = 1 + x^{2/3}$,

which of the following is NOT true?

$(A) \longrightarrow f$ *is continuous for all* real *numbers.*

$(B) \longrightarrow f$ *has a* min*imum at* $x = 0$.

$(C) \longrightarrow f$ *is increasing for* $x > 0$.

$(D) \longrightarrow f'(x)$ *exists for all* x.

$(E) \longrightarrow f''(x)$ *is* negative *for* $x > 0$.

==

15Q15. If $f(x) = e^{\tan^2 x}$, then

$f'(x) = \dfrac{d}{dx}[f(x)] =$

$(A) \longrightarrow e^{\tan^2 x}$

$(B) \longrightarrow \sec^2 x e^{\tan^2 x}$

$(C) \longrightarrow \tan^2 x \; e^{\tan^2 x \; - \; 1}$

$(D) \longrightarrow 2\tan x \; e^{\tan^2 x}$

$(E) \longrightarrow 2\tan x \ \sec^2 x \ e^{\tan^2 x}$

==

16Q16. If $e^{f(x)} = 1 + x^2$, then
$f'(x) = \dfrac{d}{dx}[f(x)] =$

$(A) \longrightarrow \dfrac{2x}{1+x^2}$

$(B) \longrightarrow \dfrac{1}{1+x^2}$

$(C) \longrightarrow 2x(1+x^2)$

$(D) \longrightarrow 2xe^{1+x^2}$

$(E) \longrightarrow 2x\ln(1+x^2)$

==

17Q17. The value of the derivative of
$y = \dfrac{\sqrt[3]{x^2+8}}{\sqrt[4]{2x+1}}$ at $x = 0$ is $y'(0) = \left|\dfrac{dy}{dx}\right|_{x\ =\ 0} =$

$(A) \longrightarrow -\ 1$

$(B) \longrightarrow -\ \dfrac{1}{2}$

$(C) \longrightarrow 0$

$(D) \longrightarrow \frac{1}{2}$

$(E) \longrightarrow 1$

==

18Q18. If $f(x) = \begin{cases} x & for \quad x \leq 1 \\ \frac{1}{x} & for \quad x > 1 \end{cases}$,

then $\int_0^e f(x)\,dx =$

$(A) \longrightarrow 0$

$(B) \longrightarrow 2$

$(C) \longrightarrow e$

$(D) \longrightarrow \frac{3}{2}$

$(E) \longrightarrow e + \frac{1}{2}$

==

19Q19. The graph of

$y = 3x^4 - 16x^3 + 24x^2 + 48$

is concave down for

$(A) \longrightarrow x < 0$

$(B) \longrightarrow x > 0$

$(C) \longrightarrow x < -2 \ or \ x > -\dfrac{2}{3}$

$(D) \longrightarrow x < \dfrac{2}{3} \ or \ x > 2$

$(E) \longrightarrow \dfrac{2}{3} < x < 2$

==

20Q20. $\displaystyle\int_0^{\pi/4} \frac{e^{\tan x}}{\cos^2 x} dx$ is

$(A) \longrightarrow 0$

$(B) \longrightarrow 1$

$(C) \longrightarrow e - 1$

$(D) \longrightarrow e$

$(E) \longrightarrow e + 1$

==

21Q21. Salmon Spawning. The number of salmon swimming upstream to spawn is approximated by

$S(x) = -x^3 + 3x^2 + 360x + 5000, \quad 6 \leq x \leq 20,$

where x represents the temperature of the water in degrees Celsius.

Find the water temperature that produces the maximum number of salmon swimming upstream.

$(A) \longrightarrow 20$

$(B) \longrightarrow 6$

$(C) \longrightarrow 10$

$(D) \longrightarrow 12$

$(E) \longrightarrow 60$

==

22Q22. The function $z = f(x, y) = x^2 + y^4 - 2y^2 + 6$ has three critical points $(0,0)$, $(0,-1)$, and $(0,1)$.

Determine the character of each critical point by using

$D = f_{xx}(x_0, y_0) . f_{yy}(x_0, y_0) - [f_{xy}(x_0, y_0)]^2$.

$(A) \longrightarrow$ f has two relative minima and one saddle point.

$(B) \longrightarrow$ f has two relative maxima and one saddle point.

$(C) \longrightarrow$ f has three relative maxima.

$(D) \longrightarrow$ f has one relative minimum and one relative maximum and one saddle point.

$(E) \longrightarrow$ f has three relative minima.

==

23Q23. The rate of infection of a disease (in people per month) is given by the function

$f'(t) = \frac{d}{dt}[f(t)] = \frac{300t}{t^2+1}$,

where t is the time in months since the disease broke out.

Find the total number of infected people over the first 3 months of the disease,

$\int_0^3 \frac{300t}{t^2+1} dt$.

$(A) \longrightarrow 416$

$(B) \longrightarrow 208$

$(C) \longrightarrow 345$

$(D) \longrightarrow 691$

$(E) \longrightarrow 900$

==

24Q24. Find the area of the region that is between the curves

$y = x^2 - 3$ and $y = 2x$

from $x = -\ 2$ to $x = 1$.

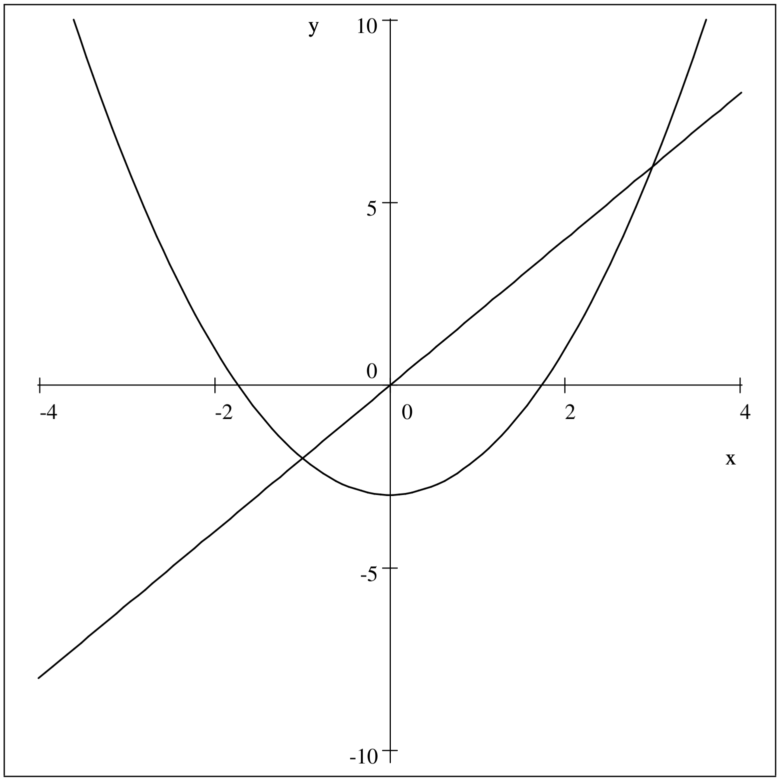
$(A) \longrightarrow \frac{23}{3}$

$(B) \longrightarrow 6$

$(C) \longrightarrow 10$

$(D) \longrightarrow \frac{28}{3}$

$(E) \longrightarrow \frac{25}{3}$



==

25Q25. Find $\int_1^e \frac{\ln x}{x^2} dx.$

$(A) \longrightarrow 1 - \frac{2}{e}$

$(B) \longrightarrow \frac{2}{e}$

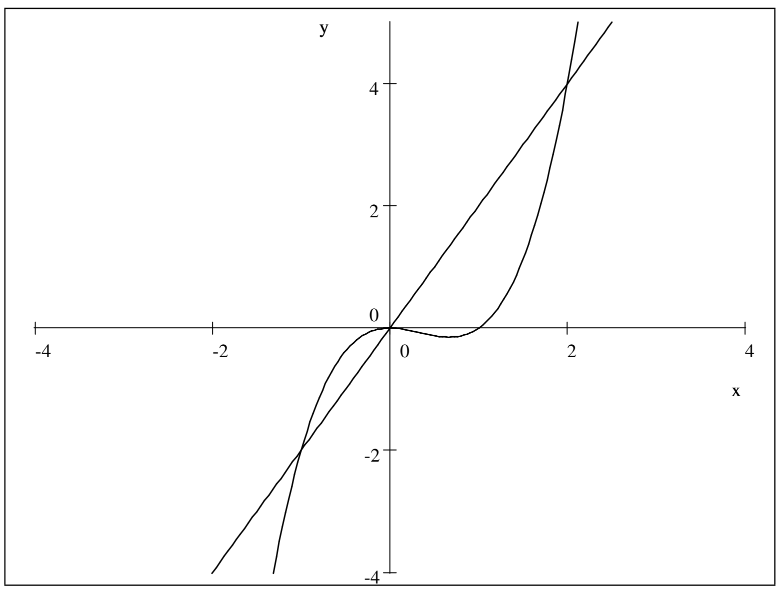
$(C) \longrightarrow e$

$(D) \longrightarrow \dfrac{e}{2}$

$(E) \longrightarrow 2 - \dfrac{e}{2}$

==

26Q26. Find the area of the region enclosed by the graphs of $y = f(x) = x^3 - x^2$ and $y = g(x) = 2x$.



$(A) \longrightarrow \dfrac{5}{12}$

$(B) \longrightarrow \dfrac{8}{3}$

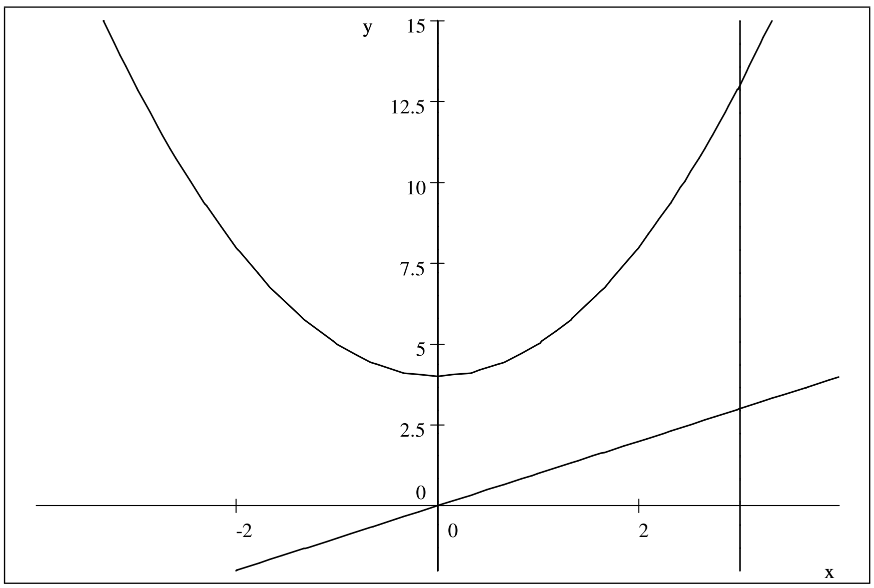
$(C) \longrightarrow \dfrac{27}{12}$

$(D) \longrightarrow \frac{37}{12}$

$(E) \longrightarrow \frac{47}{12}$

==

27Q27. Find the area of the region bounded by $y = x^2 + 4$, $y = x$, $x = 0$, and $x = 3$.



$(A) \longrightarrow \frac{33}{2}$

$(B) \longrightarrow \frac{21}{2}$

$(C) \longrightarrow \frac{38}{2}$

$(D) \longrightarrow \frac{43}{2}$

$(E) \longrightarrow \frac{47}{2}$

==

28Q28. By using differentials, an approximation of $\sqrt[3]{123}$ is

$[Hint : f(x+dx) \approx f(x) + f'(x)\,dx;\ \text{use } x = 125]$.

$(A) \longrightarrow 4\frac{13}{15}$

$(B) \longrightarrow 4\frac{23}{25}$

$(C) \longrightarrow 4\frac{73}{75}$

$(D) \longrightarrow 4\frac{97}{100}$

$(E) \longrightarrow 5\frac{2}{15}$

==

29Q29. Use the formula $\int \frac{du}{u\sqrt{u^2+a^2}} = -\frac{1}{a}\ln\left|\frac{\sqrt{u^2+a^2}+a}{u}\right| + C$ to find $\int \frac{dx}{x\sqrt{4x^2+1}}$

$(A) \longrightarrow -\ln\left|\frac{\sqrt{4x^2+1}+1}{2x}\right| + C$

$(B) \longrightarrow -2\ln\left|\frac{\sqrt{4x^2+1}+1}{2x}\right| + C$

$(C) \longrightarrow -\frac{1}{2}\ln\left|\frac{\sqrt{4x^2+1}+1}{2x}\right|+C$

$(D) \longrightarrow -4\ln\left|\frac{\sqrt{4x^2+1}+1}{4x}\right|+C$

$(E) \longrightarrow -\frac{1}{4}\ln\left|\frac{\sqrt{4x^2+1}+1}{4x}\right|+C$

==

30Q30. If $f(x,y,z) = (2x+y^2+z)^3$,
then $\frac{\partial^3 f}{\partial z \partial y \partial x} = \frac{\partial}{\partial x}\left(\frac{\partial}{\partial y}\left(\frac{\partial f}{\partial z}\right)\right) =$

$(A) \longrightarrow 0$

$(B) \longrightarrow 3+2y$

$(C) \longrightarrow 24y$

$(D) \longrightarrow 2x+y^2+z$

$(E) \longrightarrow 6(2x+y^2+z)$

==

31Q31. The slope of the tangent to the curve

$y^3x + y^2x^2 = 6$

at $(2,1)$ is

$(A) \longrightarrow -\dfrac{3}{2}$

$(B) \longrightarrow -1$

$(C) \longrightarrow -\dfrac{5}{14}$

$(D) \longrightarrow -\dfrac{3}{14}$

$(E) \longrightarrow 0$

==

32Q32. A manufacturer of a product has a marginal revenue function given by
$\dfrac{dr}{dq} = 200 + 70q - 3q^2$.
The demand function $\left[p = \dfrac{r}{q}\right]$ for the product is given by

$(A) \longrightarrow p = \dfrac{70}{q} - 6$

$(B) \longrightarrow p = 70 - 6q$

$(C) \longrightarrow p = 200q + 35q^2 - q^3$

$(D) \longrightarrow p = 200 + 35q - q^2$

$(E) \longrightarrow p = 200q + 35q^3 - q^4$

==

33Q33. Marginal-Revenue Product. A manufacturer has determined that m employees will produce a total of q units of product per day, where

$q = m(50 - m)$

If the demand function is given by

$p = -\ 0.01q + 9$

find the marginal-revenue product

$$\frac{dr}{dm} = \frac{dr}{dq} \times \frac{dq}{dm}$$

when $m = 10$. $[r = qp]$.

$$\left|\frac{dr}{dm}\right|_{m\ =\ 10} =$$

$(A) \longrightarrow 10$

$(B) \longrightarrow 20$

$(C) \longrightarrow 30$

$(D) \longrightarrow 40$

$(E) \longrightarrow 50$

==

34Q34. If $f(x) = g(x) + 7$ for $3 \leq x \leq 5$, then

$$\int_3^5 [f(x) + g(x)]\,dx =$$

$(A) \longrightarrow 2\int_3^5 g(x)\,dx + 7$

$(B) \longrightarrow 2\int_{3}^{5} g(x)\,dx + 14$

$(C) \longrightarrow 2\int_{3}^{5} g(x)\,dx + 28$

$(D) \longrightarrow \int_{3}^{5} g(x)\,dx + 7$

$(E) \longrightarrow \int_{3}^{5} g(x)\,dx + 14$

==

35Q35. Revenue. Given the revenue function

$r = 250q + 45q^2 - q^3$

use differentials to find the approximate change in revenue if the number of units increases from $q = 40$ to $q = 41$. $[Hint : \Delta r \approx dr = r'dq]$

$(A) \longrightarrow -\ 1026$

$(B) \longrightarrow -\ 950$

$(C) \longrightarrow 1026$

$(D) \longrightarrow 950$

$(E) \longrightarrow$ *None of the above Choices is correct.*

==

FINAL-EXAM-MATH-132-093

Qn#	A	B	C	D	E	Choice
1			√			C
2		√				B
3		√				B
4	√					A
5		√				B
6					√	E
7	√					A
8					√	E
9			√			C
10		√				B
11				√		D
12			√			C
13	√					A
14				√		D
15					√	E
16	√					A
17	√					A
18				√		D
19					√	E
20			√			C
21				√		D
22	√					A
23			√			C
24	√					A
25	√					A
26				√		D
27	√					A
28			√			C
29	√					A
30			√			C
31			√			C
32				√		D
33			√			C
34		√				B
35		√				B
Sum						175