

1. Going into the final exam, which will count as two tests, Courtney has test scores of 80, 81, 73, 65 and 91. What score does Courtney need on the final in order to have an average score of 80?

A. 83      B. 84      C. 85      D. 86      E. 87

2. The manager of a store that specializes in selling tea decides to experiment with a new blend. She will mix some Earl Grey tea that sells for \$5 per pound with some Orange Pekoe tea that sells for \$3 per pound to get 100 pounds of the new blend. The selling price of the new blend is to be \$4.50 per pound and there is to be no difference in revenue from selling the new blend versus selling the other types. How many pounds of the Earl Grey tea are required?

A. 70      B. 75      C. 80      D. 85      E. 90

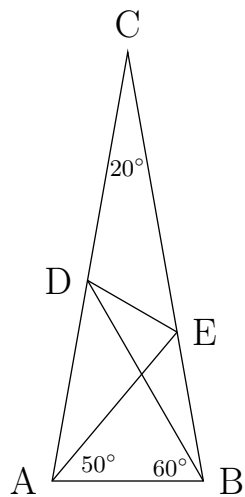
3. If  $A, B, C$  are constants such that for all values of  $x$ ,

$$x^2 - x - 2 = (Ax + B)(x - 2) + C(x^2 + 3),$$

what is the value of  $A$ ?

A. 1      B. 2      C. 3      D. 4      E. 5

4. Triangle  $ABC$  is isosceles with  $CA = CB$ . The angles  $\angle ABD$ ,  $\angle BAE$  and  $\angle C$  have measures  $60^\circ$ ,  $50^\circ$  and  $20^\circ$  respectively. Find the measure of  $\angle EDB$ .



- A.  $10^\circ$       B.  $15^\circ$       C.  $20^\circ$       D.  $25^\circ$       E.  $30^\circ$
5. Clarissa and Shawna, working together, can paint the exterior of a house in 6 days. Clarissa by herself can complete this job in 5 days less than Shawna. How long will it take Clarissa to complete the job by herself?
- A. 16 days    B. 17.5 days    C. 19 days    D. 18.5 days    E. 20 days
6. Find  $k$  such that  $f(x) = x^3 - kx^2 + kx + 2$  has the factor  $x - 2$ .
- A. 5      B. 6      C. 7      D. 8      E. 9

7. Given that  $a, b, c$  are the roots of the equation  $x^3 - 5x^2 - 7x + 14 = 0$ , find  $\frac{1}{a} + \frac{1}{b} + \frac{1}{c}$ .

- A.  $\frac{2}{7}$       B.  $\frac{5}{14}$       C.  $\frac{1}{2}$       D.  $\frac{3}{5}$       E.  $\frac{7}{5}$

8. Write  $\log\left(\frac{x^2+2x-3}{x^2-4}\right) - \log\left(\frac{x^2+7x+6}{x+2}\right)$  as a single logarithm.

- A.  $\log\left(\frac{x^2+2x-3}{x^3+9x^2+20x+12}\right)$   
B.  $\log\left(\frac{x^2+5x+6}{x^3+5x^2-8x-12}\right)$   
C.  $\log\left(\frac{x^2-2x-3}{x^3+9x^2+20x+12}\right)$   
D.  $\log\left(\frac{x^2+2x-3}{x^3+9x^2+20x-12}\right)$   
E.  $\log\left(\frac{x^2+2x-3}{x^3+5x^2-8x-12}\right)$

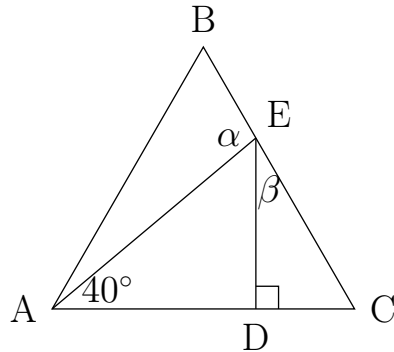
9. If  $\log_{10} 2 = a$  and  $\log_{10} 5 = b$ , then  $\log_2 20$  equals:

- A.  $\frac{a+b}{b}$       B.  $\frac{2a-b}{a}$       C.  $\frac{a+2b}{b}$       D.  $\frac{2a+b}{a}$       E.  $\frac{a+2b}{a}$

10. If  $9^x - 9^{x-1} = 216$ , then the value of  $2^x$  is:

- A.  $4\sqrt{2}$       B.  $12\sqrt{2}$       C.  $10\sqrt{5}$       D.  $4\sqrt{10}$       E.  $25\sqrt{5}$

11. Given that triangle  $ABC$  is equilateral, find  $\alpha - \beta$ .



- A.  $60^\circ$       B.  $70^\circ$       C.  $75^\circ$       D.  $76^\circ$       E.  $80^\circ$

12. Maximize  $z = 2x + y$  subject to  $x \geq 0$ ,  $y \geq 0$ ,  $x + y \leq 6$ ,  $x + y \geq 1$ .

- A. 6      B. 8      C. 10      D. 12      E. 14

13. Given  $8 \sin^2 \theta = 5 + 10 \cos \theta$ , determine which of the following is a possible value for  $\cos \theta$ .

- A.  $-\frac{3}{4}$       B.  $-\frac{2}{3}$       C.  $\frac{1}{4}$       D.  $\frac{1}{2}$       E.  $\frac{2}{3}$

14. Determine which of the following is equal to  $\tan(\sin^{-1} v)$ .

- A.  $\frac{1}{\sqrt{v^2-1}}$       B.  $\frac{v}{\sqrt{1-v^2}}$       C.  $\frac{1+v}{\sqrt{v^2-1}}$       D.  $\frac{-v}{\sqrt{1-v^2}}$       E.  $\frac{1}{\sqrt{1-v^2}}$

15. To measure the height of Lincoln's caricature on Mt. Rushmore, two sightings 800 feet from the base of the mountain are taken. If the angle of elevation to the bottom of Lincoln's face is  $32^\circ$  and the angle of elevation to the top is  $35^\circ$ , what is the height of Lincoln's face accurate to two decimal places?

- A. 30.15 ft    B. 36.29 ft    C. 45.12 ft    D. 52.16 ft    E. 60.27 ft

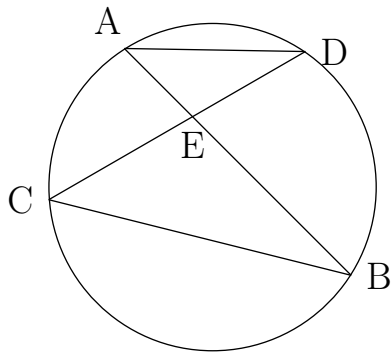
16. Let  $x + 3$ ,  $2x + 1$ , and  $5x + 2$  be consecutive terms of an arithmetic sequence. Find the absolute value of the common difference of the terms.

- A. 2            B.  $\frac{5}{2}$             C.  $\frac{7}{2}$             D. 4            E.  $\frac{9}{2}$

17. A ball is dropped from a height of 30 feet. Each time that it strikes the ground, it bounces up to 0.8 of the previous height. How many times does the ball need to strike the ground before its height remains less than 6 inches?

- A. 3            B. 5            C. 6            D. 8            E. 10

18. Given  $AE = 10$ ,  $EB = 6$ ,  $CE = 12$ , find  $ED$ .



- A. 5      B. 6      C. 7      D. 8      E. 9

19. In a survey of 270 college students, it is found that 64 like cabbage, 94 like broccoli, 58 like cauliflower, 26 like both cabbage and broccoli, 28 like both cabbage and cauliflower, 22 like both broccoli and cauliflower, and 14 like all three vegetables. How many of the 270 students do not like any of these vegetables?

- A. 96      B. 116      C. 132      D. 140      E. 160

20. An urn contains 7 white balls and 3 red balls. Three balls are selected. In how many ways can the 3 balls be drawn from the total of 10 balls if 2 balls are white and 1 is red?

- A. 45      B. 56      C. 63      D. 84      E. 120

21. If a number is selected at random from the set of all four-digit numbers in which the sum of the digits is equal to 34, what is the probability that this number will be even?

- A.  $\frac{1}{3}$       B.  $\frac{3}{10}$       C.  $\frac{2}{5}$       D.  $\frac{1}{2}$       E.  $\frac{3}{7}$

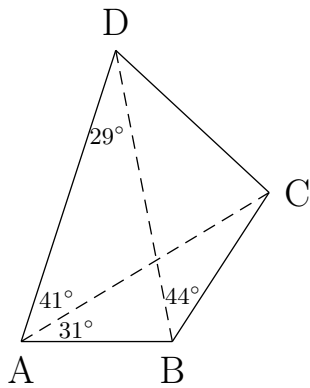
22. Which of the following numbers can be written as a sum of three integer cubes?

- A. 4504      B. 5855      C. 6256      D. 9031      E. 11291

23. How many different ways can 30 nickels, dimes and quarters be worth \$5?

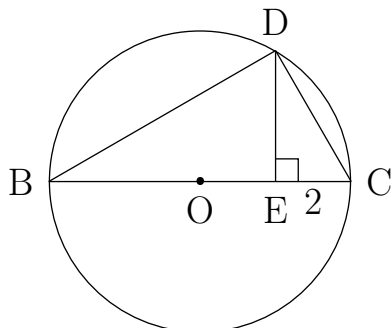
- A. 4      B. 10      C. 12      D. 20      E. 27

24. Consider the quadrilateral  $ABCD$ . Given that  $AB$  has length 120, find the length  $CD$ .



- A. 104      B. 120      C. 136      D. 150      E. 166

25. Given circle of diameter  $BC = 6$  with  $EC = 2$ , find the square of the length  $BD$ .



- A. 16      B. 24      C. 25      D. 28      E. 36
26. Let  $P$  be an interior point of an equilateral triangle  $ABC$  such that  $PA = 6$ ,  $PB = 8$  and  $PC = 10$ . Then the area of triangle  $ABC$  to the nearest integer is:
- A. 50      B. 79      C. 91      D. 125      E. 136
27. A number  $M$  has three digits when expressed in base 5. When  $M$  is expressed in base 7 the digits are reversed. The middle digit is:
- A. 0      B. 1      C. 2      D. 3      E. 4
28. Given that  $3 \sin \theta - 4 \sin^3 \theta = \frac{1}{2}$ , find the value of  $1 + \sin(3\theta)$ .
- A.  $\frac{1}{4}$       B.  $\frac{1}{2}$       C.  $\frac{2}{3}$       D.  $\frac{3}{4}$       E.  $\frac{3}{2}$



29. Let  $f_1(x) = \frac{x-1}{x+1}$  and define  $f_{n+1}(x) = f_1(f_n(x))$  for  $n = 1, 2, 3, \dots$ . It can be verified that  $f_{29} = f_5$ . Then  $f_{22}(x)$  is:

- A.  $-\frac{1}{x}$       B.  $\frac{-x-1}{x-1}$       C.  $\frac{1}{x-1}$       D.  $x$       E. None of these

30. If the grid is filled in so that every row, every column, and every 3x3 box contains the digits 1 through 9, what is the value of N?

			5	2	8		3
N			7	8	2		6
						5	
7	1			3		8	
		5			6		
	3		8			1	5
	8						
6		9	1	5			
2		4	9	6			

- A. 1      B. 3      C. 4      D. 5      E. 9

## Answer Key

Problem	Answer
1.	C
2.	B
3.	A
4.	E
5.	D
6.	A
7.	C
8.	E
9.	D
10.	A
11.	B
12.	D
13.	C
14.	B
15.	E
16.	C
17.	D
18.	A
19.	B
20.	C
21.	B
22.	C
23.	A
24.	E
25.	B
26.	B
27.	A
28.	E
29.	A
30.	D