Updated Questions

Test 1, Section 4 (Calculator)

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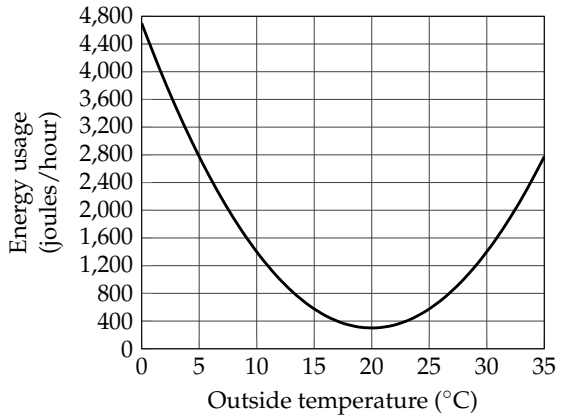
Questions 24-25 refer to the following information.



An aquarium relies on an energy source to keep it at room temperature. The aquarium is cooled when the outside temperature is greater than room temperature and heated when the outside temperature is less than room temperature. The graph above gives the aquarium's energy usage, in joules per hour, at different outside temperatures, in degrees Celsius.

24

At an outside temperature of 25° Celsius, which of the following is closest to the total amount of energy, in joules, used by the aquarium over 3 hours?

A) 600
B) 1,800
C) 3,600
D) 5,400

25

$$E(x) = a(x-20)^2 + 300$$

The function E, defined above, is used to model the aquarium's energy usage, in joules per hour, at an outside temperature of $x°$ Celsius. For which of the following values of a does E best approximate the values given by the graph?

A) 8
B) 11
C) 14
D) 25

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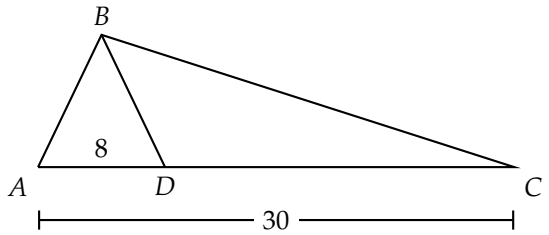
Test 2, Section 3 (No Calculator)

13

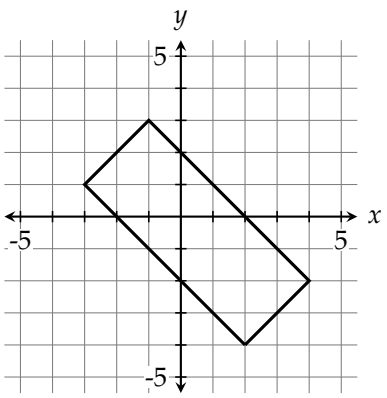


The area of triangle ABC above is 75. If $AD = 8$ and $AC = 30$, what is the area of triangle BDC ?

A) 40
B) 45
C) 50
D) 55

Test 4, Section 3 (No Calculator)

10



What is the area, in square units, of the rectangle shown in the xy-plane above?

A) 10
B) $10\sqrt{2}$
C) 16
D) 20

Test 7, Section 4 (Calculator)

13

Sam makes a one-time deposit of $1,000 into an account that earns 4 percent interest compounded annually. Which of the following is closest to the total amount of interest earned in the account after 3 years?

A) $115
B) $120
C) $125
D) $130

18

An employment agency surveyed a random sample of 200 engineers working in Chicago and found that the mean annual salary of the engineers in the sample was $100,000 with an associated margin of error of $10,000. Which of the following conclusions is the most reasonable based on these data?

A) Most of the engineers working in Chicago earn exactly $100,000 in annual salary.
B) All engineers working in Chicago earn between $90,000 and $110,000 in annual salary.
C) It is unlikely that an engineer working in Chicago has an annual salary below $100,000.
D) The mean annual salary for all engineers working in Chicago is between $90,000 and $110,000.

Answers

Test 1, Section 4 (Calculator)

24. $\boxed{B}$ According to the graph, the aquarium uses about 600 joules per hour when the outside temperature is 25° C. That's a total of $600 \times 3 = 1,800$ joules over 3 hours.

25. $\boxed{B}$ The strategy here is to use a point from the graph. When $x = 0$, $E \approx 4,700$. Plugging this point into the model equation,

$$\begin{aligned} 4,700 &= a(0-20)^2 + 300 \\ 4,700 &= 400a + 300 \\ 4,400 &= 400a \\ a &= 11 \end{aligned}$$

We can be pretty confident $a = 11$ is the answer, but it's worth noting that in these types of questions, it's always a good idea to test more than one point on the graph for confirmation.

Test 2, Section 3 (No Calculator)

13. $\boxed{D}$ Let the height of $\triangle ABC$ be h. Since the area of $\triangle ABC$ is 75,

$$\begin{aligned} \frac{1}{2}(AC)h &= 75 \\ \frac{1}{2}(30)h &= 75 \\ 15h &= 75 \\ h &= 5 \end{aligned}$$

Since $\triangle ABD$ also has height h, its area is $\frac{1}{2}(8)(5) = 20$. Now we can find the area of $\triangle BDC$ by subtracting the area of $\triangle ABD$ from the area of $\triangle ABC$: $75 - 20 = 55$.

Test 4, Section 3 (No Calculator)

10. $\boxed{D}$ The short side of the rectangle is the hypotenuse of a 45–45–90 triangle with legs of length 2. Therefore, the short side has a length of $2\sqrt{2}$ (you could've also used the pythagorean theorem to calculate this length). Similarly, the long side of the rectangle is the hypotenuse of a 45–45–90 triangle with legs of length 5. So the long side has a length of $5\sqrt{2}$. The area of the rectangle is then base times height: $5\sqrt{2} \times 2\sqrt{2} = 10 \times 2 = 20$.

Test 7, Section 4 (Calculator)

13. $\boxed{C}$ The total balance in the account after 3 years is $1000(1.04)^3$. Subtracting the initial deposit of \$1,000 from the total balance gives us the total interest earned: $1000(1.04)^3 - 1000 \approx \$125$.

18. $\boxed{D}$ Answer D is the most reasonable. Since the mean salary for the sample was \$100,000 with a \$10,000 margin of error, it's likely that the mean salary for all Chicago engineers is \$100,000, give or take \$10,000. Answers A, B, and C are wrong because the given data only allow us to draw conclusions about the mean salary, not the actual salaries of Chicago engineers. For instance, it's possible for the mean to be \$100,000 without any engineer actually having a \$100,000 salary (e.g. half the engineers have \$50,000 salaries while the other half have \$150,000 salaries). That's why answer A is wrong. Answer B is wrong for pretty much the same reason. A mean salary between \$90,000 and \$110,000 does not require that all Chicago engineers have a salary in that range. Finally, answer C is wrong because the mean doesn't tell us anything about how likely any given engineer is above or below it. It's possible that all Chicago engineers have salaries below \$100,000 except a few who make millions of dollars and skew the mean upwards.