1. **C** Let x = remaining test grade. $(92 + 85 + 90 + 91 + 83 + x)/6 = 89.5$. Solving gives us x = **96.**
2. **B** Let x = time Randal drives, in hours. Then $x - \frac{1}{4}$ = Dede's driving time. Their distances will be equal when she catches up with him, so $30x = 40(x - \frac{1}{4})$. Solving gives us $x = 1$ (hour), or **8:00am.**
3. **A** Let x = the number; $1/x$ is then its reciprocal. $x+\frac{1}{x}=\frac{13}{6} \Rightarrow 6x^2+6=13x \Rightarrow 6x^2-13x+6=0$. This factors to $(3x - 2)(2x - 3) = 0$, so $x = 2/3$ or $3/2$, and the respective reciprocals are 3/2 and 2/3. Either way, the absolute value of the difference of the number and its reciprocal is $\mathbf{^5/_6}$.
4. **A** $2l + 2w = 26$ and $l = 2w - 5$. Solving by substitution, $2(2w-5) + 2w = 26$, $6w = 36$, so $w = 6$. Therefore $l = 7$ and the area is **42.**
5. **D** Let m = the number of minutes to fill the pool. $20m - 12m = 16{,}200$. $8m = 16{,}200$, so $m = 2{,}025$ minutes, which is about **33 ¾ hours.**
6. **A** Let p = plane's speed in still air, and w = wind speed. The rates of travel for head wind and tail wind are, respectively, $p-w = (1440)/4$ and $p + w = (1{,}440)/3.6$, or $p - w = 360$ and $p + w = 400$. Solving the system gives us $p = 380$ and w = **20**.
7. **B** Let n = the first number; then $n + 12$ = the second number, and $2(n + 12)$ = the third number. Their sum is 188, so $n + n + 12 + 2(n + 12) = 188$. Solving, we get $n = 38$. The other numbers are 50 and 100, so the difference between the largest and smallest is **62.**
8. **D** Since the area is 60, the altitude must be 12. The altitude forms two right triangles with legs of length 5 and 12. Using the Pythagorean theorem we can solve for the length of the hypotenuse, which is also the length of each of the legs of the original triangle. $5^2 + 12^2 = c^2$ gives us $c = 13$. So the perimeter is 13 + 13 + 10 = **36** cm.
9. **C** $\frac{{}_8C_4 \cdot {}_6C_1}{{}_{14}C_5}=\frac{70\cdot 6}{14\cdot 13\cdot 11}=\frac{30}{143}$
10. **C** Let $x + 6$ = the original length (in inches) of the square of tin. Then the box formed will have sides of length 3, x, and x. The volume of the box will be $3x^2 = 363$, or $x^2 = 121$, so $x = 11$, and the original length of the tin was **17.**
11. **D** We must arrange the 3 officers (in 3! ways), then arrange the other 6 people (in 6! ways). The product is (6!)(3!) = **4,320.**
12. **E** Our general equation is $y=\frac{kx^2}{z}$. Substituting the given information, we get $k = 9/2$. Substituting again gives us $12=\frac{9}{2}\cdot\frac{(6)^2}{z}$; solving we get $z=\frac{27}{2}$.
13. **D** Let x = quarts of pure antifreeze to add. $7(.10) + x(1.00) = (7 + x)(.30)$; this yields x = **2.**
14. **B** Let the 3 dimensions of the box be l, w, and h. Then the diagonal, d, is found by $l^2 + w^2 + h^2 = d^2$, so $l^2 + w^2 + h^2 = 169$. The total surface area is $2lw + 2lh + 2wh = 192$. We can add these two equations, so $l^2 + w^2 + h^2 + 2lw + 2lh + 2wh = 361$. This factors to $(l + w + h)^2 = 361$, so this gives us $l + w + h = 19$. The box has 4 edges of each dimension, so the total of the lengths of all the edges is 4(19) or **76.**
15. **E** $x - y = 6$ and $xy = 25$. Squaring the first equation: $(x - y)^2 = 36$ gives us $x^2 - 2xy + y^2 = 36$. If we add $(2xy)$ to the left side, we can add 50 to the right side. This gives us $x^2 - y^2$ = **86**.
16. **B** The area has three parts: ¾ of a circle with radius 24, ¼ of a circle with radius 4, and ¼ of a circle with radius 8. These areas are: $\frac{3}{4}(24)^2\pi + \frac{1}{4}(4)^2\pi + \frac{1}{4}(8)^2\pi = 432\pi + 4\pi + 16\pi = \mathbf{452\pi}$.
17. **C** If the circumference of the earth is $2\pi r$, then the extended band has a circumference $2\pi r + 36$. Another way to express this is $2\pi(r+x)$, where $(r + x)$ is the radius of the circumference when the extra 36 feet is included. Setting these equal: $2\pi r + 36 = 2\pi(r + x)$, so $2\pi r + 36 = 2\pi r + 2\pi x$. This gives us $36 = 2\pi x$, so $x = 18/\pi$. Since π is slightly greater than 3, $18/\pi$ must be **slightly less than 6**.
18. **B** Pages 1 – 9 contain 9 digits. Pages 10 – 99 contain 2(90) or 180 digits. That leaves (1128 – 189) or 939 digits, which would be 313 3-digit numbers. Starting with 100, the 313th 3 digit number is **412**.

19. **E** The number of cans in each row is the same as the row number. So the bottom row is the nth row and it contains n cans. The sum is $S_n = 300 = \frac{n(1+n)}{2}$. Solving we get $n^2 + n - 600 = 0$, which factors to $(n – 24)(n + 25) = 0$, so there are **24 rows**.

20. **B** The area of the garden itself is 135 – 72 or 63 sq. ft. Its dimensions can be represented by $(15 – 2x)$ and $(9 – 2x)$, with x = the width of the walkway. The garden area is then $(15 – 2x)(9 – 2x) = 63$. This expands to $135 – 48x + 4x^2 = 72$, or $4x^2 – 48x + 63 = 0$. Factoring we have $(2x – 3)(2x – 21) = 0$, therefore $x = 3/2$ or **1½ .**

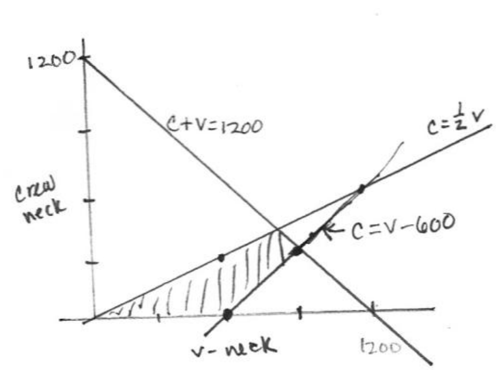
21. **A** To find the average speed for the entire trip, we need to divide the total distance travelled by the total time spent travelling. Let d = the distance each person drove. Then based upon their respective rates of travel, we can represent their times driving as $(d \div 75)$, $(d \div 60)$, and $(d \div 45)$. So the expression representing the average speed of the whole trip is $\frac{3d}{\frac{d}{75}+\frac{d}{60}+\frac{d}{45}}$. We can simplify this by multiplying the fraction by the number 1 in the form $\frac{900}{900}$, since 900 is the least common multiple of 75, 60, and 45. This gives us $2700 \div 47$, which is $57\ ^{21}/_{47}$. The choice closest to this is **57.**

22. **D** (0.35)(0.20) = 0.07 = percent who saw the ad and made a purchase. (0.8)(0.4) = 0.32 = percent who saw the ad, but did not make a purchase. So a total of 39% of the potential customers saw the ad. The percent of those who saw the ad and made a purchase is 0.07/0.39 ≈ 17.9% or **18%.**

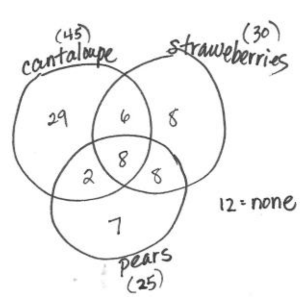
23. **E** Since the value increased geometrically, we can represent the situation by letting r = the rate of increase each year, and $1{,}620r^4 = 5{,}120$. Solving we have $r^4 = 5120/1620$ which reduces to 256/81, so $r = 4/3$, or approximately 1.33. This would be an annual rate of increase of about **33%**.

24. **B** Set up the ellipse with center at the origin and the major axis going from (-18,0) to (18, 0) and the minor axis going up to (0, 12). The equation of this ellipse is $\frac{x^2}{18^2}+\frac{y^2}{12^2}=1$. The point in question is $(x, 6)$, so substituting 6 for y, and solving for x, we get the distance x from the point to the center of the arch is **9√3**.

25. **E** Let v = the number of v-neck shirts produced, and c = the number of crew neck shirts produced. The given constraints are: c + v ≤ 1200, v ≤ c + 600, and c ≤ ½ v. Sketching the associated lines and shading the intersection of the inequalities, we have the graph shown, with the intersection points at (600, 0), (900, 300), and (800, 400). Test each of these in the profit function P(v,c) = 1.5v + 2c:
P(900, 300) = 1,950
P(800, 400) = 2,000
P(600, 0) = 900
The maximum profit possible is **$2,000**.



26. **D** Using a Venn diagram, we can organize the information. Finding the sum of the individual parts, we get the total number surveyed is **80.**



27. **C** Substituting 4.5 for R gives us 4.5 = *log*I, which means $10^{4.5} = I$. Using the rules for exponents, we get $I = 10^4 \times 10^{0.5}$, or 10,000 x √10. We can estimate the square root of 10 as being slightly greater than √9, or slightly greater than 3. The best approximation in the choices is **32,000**.

28. **D** Since 5, 7, and 9 are relatively prime, the number of marbles is 2 more than their lowest common multiple. The LCM of 5, 7, and 9 is their product, which is 315, so the number of marbles is 317. If they are taken 11 at a time, the number left is the remainder of 317 ÷ 11, which is **9**.

29. **B** Let t = the tens digit of the original number, and u = the units digit of the original number. The value of the original number is $10t + u$; when the digits are reversed, the value of the resulting number is $10u + t$. Set up a system of equations: $u = 2 + t$ and $10u + t = 2(10t + u) - 39$. Solving we get $t = 5$, so $u = 7$, so the original number is 57. Its smallest prime factor is **3.**

30. **C** Let c = the cost of one cheeseburger and s = the cost of one salad. The system of equations is: $2s + 3c = 11.3$ and $4s + 5c = 21$. Solving we get c = \$1.60 and s = \$3.25. The cost of 3 salads and 2 cheeseburgers is **\$12.95.**