



11. A math test has 20 questions. Each correct answer is 3 points and every wrong answer deducts 1 point. Qiang earned a score of 44 and didn't leave any questions blank. How many questions did Qiang get correct?
- a. 8                      b. 12                      c. 13                      d. 16                      e. 18
12. Crane R can unload a truck in 5 hours. Crane G can unload the same amount in 4 hours. Crane R started unloading a truck at 10:00 am. Crane G became free and started helping unload the truck at noon. At what time was the unloading complete?
- a. 12:27 p.m.            b. 1:00 p.m.            c. 1:20 p.m.            d. 2:00 p.m.            e. 2:23 p.m.
13. Factor and simplify  $\frac{a^3-b^3}{a^2-b^2}$
- a.  $\frac{a^2+ab+b^2}{a+b}$             b.  $a+b$                       c.  $\frac{a^2-ab+b^2}{a-b}$             d.  $a-b$                       e.  $\frac{a^2+ab-b^2}{a+b}$
14. If 6 boys fill 6 notebooks in 6 weeks and 4 girls fill 4 notebooks in 4 weeks, how many notebooks will a class of 12 boys and 12 girls fill in 12 weeks?
- a. 20                      b. 24                      c. 30                      d. 36                      e. 60
15. A conveyor belt moves at 0.25 feet per second. A machine removes the items at a rate of 6 per minute. How far apart must the items be placed so that the next item will arrive just as the machine is ready to remove it?
- a. 18 inches              b. 25 inches              c. 30 inches              d. 36 inches              e. 60 inches
16. It's between 11:00 a.m. and noon. In 13 minutes it will be as many minutes short of 1 p.m. as it was past 11 a.m. just seven minutes ago. What time is it now?
- a. 11:34 a.m.            b. 11:40 a.m.            c. 11:50 a.m.            d. 11:53 a.m.            e. 11:57 a.m.
17. Find the exact value of x if  $14e^{3x+2} = 560$ .
- a.  $\frac{\ln 40 - 2}{3}$                       b.  $\frac{\ln 28}{3}$                       c.  $\frac{\ln 16}{3}$                       d.  $\frac{40 - \ln 2}{3}$                       e.  $\frac{\ln 20 - 4}{3}$
18. In  $\triangle ABC$ , D is on  $\overline{AB}$  and E is on  $\overline{AC}$  such that  $\overline{DE}$  is parallel to  $\overline{BC}$ . If  $AD = 9$ ,  $BD = 6$ , and  $DE = 4$ , then  $BC =$
- a.  $2\frac{2}{3}$                       b.  $5\frac{1}{3}$                       c.  $6\frac{2}{3}$                       d.  $7\frac{1}{3}$                       e.  $13\frac{1}{2}$
19. A whale weighs 65,536 pounds on January 1. During January, its weight increases by 50%. Because of a long migration during February, its weight decreases by 50% during that month. But resting happily at its destination during March, its weight increases by 50% during that month. During April it does not have access to enough fish so its weight decreases by 50%. It continues alternately gaining 50% and losing 50% of its weight for the remaining eight months of the year. How many pounds does the whale weigh on Dec. 31?
- a. 11,664                      b. 23,328                      c. 32,768                      d. 65,536                      e. 131,075
20. Two angles of a quadrilateral have the same measure. The measure of the third angle is equal to the sum of the two equal angles. The measure of the fourth angle is  $60^\circ$  less than twice the sum of the other three angles. Find the measure of the largest angle.
- a.  $160^\circ$                       b.  $180^\circ$                       c.  $220^\circ$                       d.  $240^\circ$                       e.  $300^\circ$

21. If  $6x + 7y = 2004$  and  $7x + 6y = 4002$ , then  $x + y =$
- a. 221                      b. 400                      c. 462                      d. 487                      e. 770
22. Four fair coins are tossed. What is the probability there will be two heads and two tails showing?
- a.  $\frac{1}{8}$                       b.  $\frac{1}{4}$                       c.  $\frac{3}{8}$                       d.  $\frac{1}{2}$                       e.  $\frac{5}{8}$
23. Solve  $\frac{x^2+3x-4}{x-3} \geq 0$
- a.  $(-1 \leq x < 3)$  or  $(x \geq 4)$                       b.  $(-4 \leq x \leq 1)$  or  $(x > 3)$                       c.  $(x \leq 1)$  or  $(3 < x \leq 4)$
- d.  $(1 \leq x < 3)$  or  $(x \geq 4)$                       e.  $(-3 < x \leq 1)$  or  $(x \geq 4)$
24. Each of the "golden arches" at a McDonald's restaurant is in the shape of a parabola. Each arch is modeled by:  $h(x) = -x^2 + 6x$ , where  $h(x)$  is the height of the arch (in feet) at a distance  $x$  (in feet) from one side. How high, in feet, is the arch at its axis of symmetry?
- a. 6                      b. 9                      c. 12                      d. 15                      e. 18

The three remaining questions on this page refer to the figures at the bottom of the page.

25. Find the area, in square units, of the polygon in Figure 1 (below, left).
- a. 8.5                      b. 10                      c. 11                      d. 11.5                      e. 13
26. In Figure 2 (below, center), ABCDE is a regular pentagram. Find the measure of angle A.
- a.  $18^\circ$                       b.  $24^\circ$                       c.  $30^\circ$                       d.  $36^\circ$                       e.  $40^\circ$
27. A sign is held up with a brace as shown in Figure 3 (below, right). The distance from the bottom of the brace to the bottom of the sign is 2 feet. To be effective, the top of the brace must reach at least  $\frac{2}{3}$  the height of the sign. What is the maximum height the sign can be if the length of the brace is 8 feet?
- a. 7.75 feet                      b. 11.62 feet                      c. 12.37 feet                      d. 26.67 feet                      e. 34.86 feet

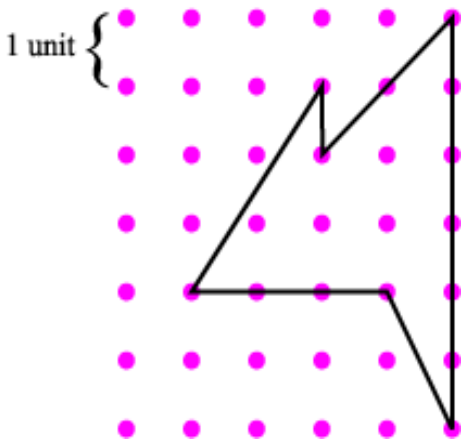


Figure 1

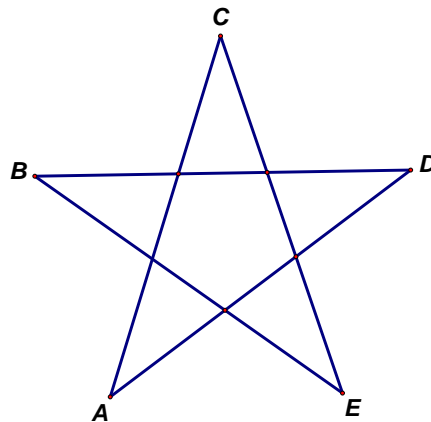


Figure 2

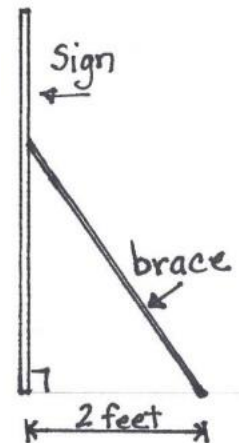


Figure 3

28. What is the units digit of  $3^{2013}$ ?
- a. 1                      b. 3                      c. 6                      d. 7                      e. 9
29. How many natural number pairs of  $(x, y)$  satisfy the equation  $20x + 13y = 2013$ ?
- a. 5                      b. 6                      c. 7                      d. 8                      e. 9
30. Find the standard form of the equation of the circle for which the endpoints of a diameter are  $(-2, -2)$  and  $(4, -6)$ .
- a.  $(x + 1)^2 + (y - 4)^2 = 13$                       b.  $(x - 1)^2 + (y + 4)^2 = 13$                       c.  $(x - 4)^2 + (y + 6)^2 = 52$
- d.  $(x + 1)^2 + (y - 4)^2 = 52$                       e.  $(x - 2)^2 + (y - 2)^2 = 13$
31. Find the equation of the line that passes through  $(2, -1)$  and is perpendicular to  $2x - 3y = 5$ .
- a.  $y = \frac{-3}{2}x + 3$                       b.  $y = \frac{-2}{3}x + 5$                       c.  $y = \frac{-2}{3}x + 2$                       d.  $y = \frac{-3}{2}x + 5$                       e.  $y = \frac{-3}{2}x + 2$
32. One fair six-sided die is rolled, and then a second die is rolled. What is the probability that the number on the second die will be larger than the number on the first die?
- a.  $\frac{5}{36}$                       b.  $\frac{5}{12}$                       c.  $\frac{11}{36}$                       d.  $\frac{1}{2}$                       e.  $\frac{5}{6}$
33. A cylinder holds five spheres of diameter  $D$ , in one row, with no extra room on the top, bottom or sides. Which volume below, in cubic units, most closely approximates the volume of this cylinder?
- a.  $\frac{5}{4}\pi D^3$                       b.  $\frac{5}{6}\pi D^3$                       c.  $\frac{20}{3}\pi D^3$                       d.  $5\pi D^3$                       e.  $20\pi D^3$
34. Two fair dice are rolled, and the difference between the two numbers on the dice is seen to be 4. What is the probability that a third die rolled will be no smaller than the larger of the first two dice?
- a.  $\frac{1}{4}$                       b.  $\frac{1}{12}$                       c.  $\frac{7}{36}$                       d.  $\frac{1}{108}$                       e.  $\frac{5}{108}$
35. Which one of the following functions meets these two criteria:  
 $f(0) = 0$  and, for all  $x$ ,  $f(x + 1) = 2f(x) + 1$ ?
- a.  $f(x) = 1 - 2^x$                       b.  $f(x) = 2x$                       c.  $f(x) = 2x^2 - x$                       d.  $f(x) = -2^x - 1$                       e.  $f(x) = 2^x - 1$
36. A farmer with 2000 feet of fencing wants to enclose a rectangular plot that borders on a straight river. If the farmer does not fence the side along the river, what is the largest rectangular area that can be enclosed?
- a. 95,000 ft<sup>2</sup>                      b. 320,000 ft<sup>2</sup>                      c. 500,000 ft<sup>2</sup>                      d. 600,000 ft<sup>2</sup>                      e. 640,000 ft<sup>2</sup>
37. A student dance committee, consisting of 2 boys and 3 girls, is to be chosen from among 4 boys and 8 girls. How many different committees are possible?
- a. 38                      b. 192                      c. 214                      d. 336                      e. 362

End of exam