

## Sample ACT Math Questions from Problem-Attic

- 1 If the values of  $X$  and  $Y$  in the following fraction are both tripled, how does the value of the fraction change?

$$\frac{XZ}{Y}$$

- a) increases by half      b) decreases by half      c) triples  
 d) doubles      \*e) remains the same
- 2 A regular box of *Crunchy Flake* cereal has dimensions  $7 \times 2 \times 10$  inches. A sample-size box has dimensions  $2\frac{1}{2} \times 2 \times 7$  inches. How many times larger, by volume, is the regular box than the sample-size box?
- a)  $2\frac{1}{2}$       b)  $3\frac{1}{3}$       \*c) 4      d) 5      e) 7
- 3 Which expression is equivalent to  $9\sqrt{27} - 5\sqrt{12}$ ?
- a) 4      b) 17      c)  $5\sqrt{3}$       \*d)  $17\sqrt{3}$       e)  $37\sqrt{3}$
- 4 Given integers  $m$ ,  $n$  and  $p$ . If  $m \times n = p$  and  $p \neq 0$ , which of the following statements is *false*?
- a)  $p \div m = n$       b)  $n \times m = p$       \*c)  $m = 0$       d)  $m \neq 0$       e)  $p \div n = m$
- 5 How long is  $\overline{XY}$  in terms of  $a$  and  $b$ ?

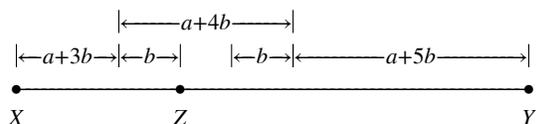
\*a)  $3a + 12b$

b)  $6a + 14b$

c)  $6a^2 + 16b^2$

d)  $3a^2 + 2ab + 12b^2$

e)  $6a^4 + 2a^2b^2 + 16b^4$

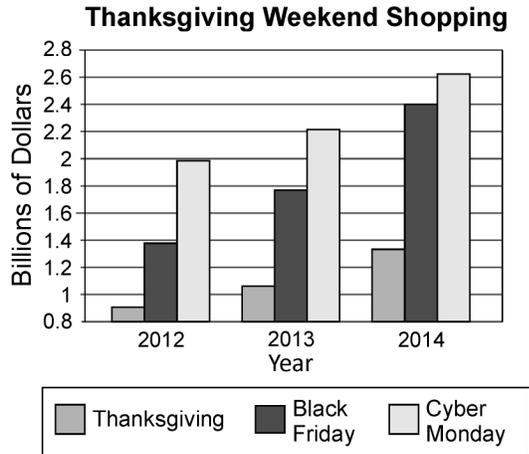


- 6 When  $\frac{8450}{0.40}$  is simplified and written in the form  $A \times 10^B$  for scientific notation, what is the value of  $B$ ?
- a)  $-3$       b)  $-2$       c)  $2$       d)  $3$       \*e)  $4$
- 7 15% is less than which of the following numbers?
- a)  $\frac{3}{20}$       b)  $0.14$       \*c)  $\frac{15}{10}$       d)  $0.1$       e)  $\frac{1}{10}$
- 8  $\frac{(5 \times 10^9)(8 \times 10^{-2})}{2 \times 10^3}$  is equivalent to:
- a)  $2 \times 10^3$       \*b)  $2 \times 10^5$       c)  $2 \times 10^6$       d)  $2 \times 10^9$       e)  $2 \times 10^{11}$
- 9 The starting pay for an employee at Bath-Mart is \$2000 a month plus a 10% commission on all sales over \$500. How much would an employee earn in one month if her sales for the month were \$5550?
- a) \$2005.55      \*b) \$2505.00      c) \$2555.00      d) \$6105.50      e) \$7550.00
- 10 At a toy factory, the workers paint 408 figurines in 3 hours. If they continue to work at that same rate, how many figurines will they paint in an 8-hour day?
- a) 153      b) 680      \*c) 1088      d) 3264      e) 4896
- 11 Using his desktop computer, William can convert a folder full of graphics in about 1 minute. Using his laptop computer, he can convert the same graphics in 1 minute and 30 seconds. About how much time would it take to convert the graphics if both computers did the work together?
- a) 32 seconds      \*b) 36 seconds      c) 45 seconds      d) 54 seconds      e) 1 minute

- 12 There are 6 plates, 5 saucers, and 5 cups on the counter. Andrew accidentally knocks off two of the items and breaks them. What is the probability that he broke a cup and a saucer, in that order?

- a)  $\frac{1}{24}$       b)  $\frac{1}{16}$       c)  $\frac{1}{12}$       \*d)  $\frac{5}{48}$       e)  $\frac{1}{8}$

- 13 The following graph contains information about online shopping habits.



Between which category and years is the percent increase in sales the lowest?

- \*a) Cyber Monday, 2012–2013      b) Black Friday, 2012–2013  
 c) Thanksgiving, 2012–2013      d) Cyber Monday, 2013–2014  
 e) Black Friday, 2013–2014
- 14 The average high temperature in Washington, D.C. during four days in July was  $89^{\circ}\text{F}$ . The temperatures on three of those days were recorded at  $84^{\circ}$ ,  $90^{\circ}$ , and  $92^{\circ}$ . What was the temperature on the fourth day?

- a)  $86^{\circ}$       b)  $87^{\circ}$       c)  $88^{\circ}$       d)  $89^{\circ}$       \*e)  $90^{\circ}$

- 15 If  $k = x^a$ , then what is  $x^{a-2}$ ?

- a)  $\frac{2k}{x}$       b)  $\frac{x}{2k}$       \*c)  $\frac{k}{x^2}$       d)  $\frac{x}{k^2}$       e)  $\frac{x}{k}$

16 What is  $tv + tw$  for  $t = -4$ ,  $v = 3$ , and  $w = -2$ ?

- \*a)  $-4$       b)  $-20$       c)  $20$       d)  $4$       e)  $-6$

17 The expression  $-12c^3d^2 + 15c^2d^3 - 3cd^4$  is the product of  $4c^2 - 5cd + d^2$  and what monomial?

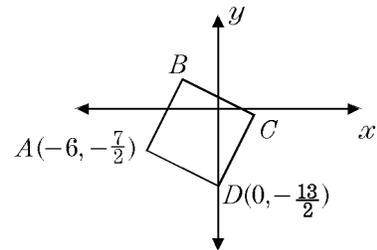
- a)  $-3c^2d^2$       \*b)  $-3cd^2$       c)  $-3c^2d$       d)  $3cd$       e)  $3$

18 If  $\frac{1}{s} = \frac{1}{x} - \frac{1}{y}$ , then  $x$  is equivalent which expression?

- a)  $s + y$       b)  $y - s$       \*c)  $\frac{sy}{s + y}$       d)  $\frac{sy}{y - s}$       e)  $\frac{y + s}{sy}$

19 What is the perimeter of square  $ABCD$ ?

- a)  $\sqrt{5}$       b)  $3$       c)  $3\sqrt{5}$   
\*d)  $12\sqrt{5}$       e)  $34$



20 The weight  $W$  of an object varies inversely as the square of the distance  $d$  from the center of the earth. At sea level, which is 6,400 km from the center of the earth, an astronaut weighs 100 lb. How far from the center of the earth must the astronaut be in order to weigh 64 lb?

- \*a) 8,000 km      b) 10,000 km      c) 40,960 km  
d) 64,000 km      e) 100,000 km

21 What are all the integers  $k$  so that  $3y^2 + ky + 5$  is factorable?

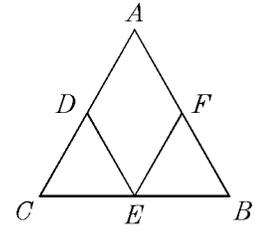
- a) 1 and 8      b) 2 and 10      c) 4 and 12      d) 6 and 14      \*e) 8 and 16



- 27 Given  $|2x + 15| \leq -1$ , which of the following is true?
- a)  $x \leq -8$  or  $x \geq 7$       b)  $x \leq -8$       c)  $x \geq 7$   
d)  $-8 \leq x \leq 7$       \*e) no solution exists
- 28 For what value(s) of  $k$  does  $x^2 - kx + 5 = 0$  have two different real roots?
- a)  $-2\sqrt{5} < k < 2\sqrt{5}$       \*b)  $k > 2\sqrt{5}$       c)  $k < 2\sqrt{5}$   
d)  $k = 2\sqrt{5}$       e)  $k = \pm 2\sqrt{5}$
- 29 Sequence  $A$  has this pattern: 810, 794, 778, 762, . . . .  
Sequence  $B$  has this pattern: 160, 157, 154, 151, . . . .  
If  $A$  and  $B$  are continued, which of the following numbers will appear in both sequences?
- a) 8      b) 9      \*c) 10      d) 11      e) 12
- 30 The lines  $2x - 3y + 5 = 0$ ,  $y = -3$ , and  $x = k$  all intersect at the same point. What is the value of  $k$ ?
- \*a)  $-7$       b)  $-4$       c)  $-2$       d) 2      e) 7
- 31 At the cafeteria, four cartons of milk and seven grilled cheese sandwiches cost \$8.10. If milk costs half as much as a sandwich, what is the cost of two cartons of milk and three grilled cheese sandwiches?
- a) \$3.20      \*b) \$3.60      c) \$4.10      d) \$4.70      e) \$5.10

- 32 In the figure,  $ABC$  is an equilateral triangle with a perimeter of 12. What is the perimeter of rhombus  $ADEF$ ?

\*a) 8      b) 12      c)  $3\sqrt{3}$       d)  $4\sqrt{2}$       e)  $4\sqrt{3}$



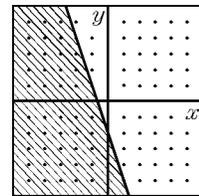
- 33 What are the possible values of  $x$  for the following inequality?

$$-12x + 9x^2 + 4 \leq 0$$

a)  $-\frac{2}{3}$       \*b)  $\frac{2}{3}$   
 c)  $\frac{5}{2}$       d) all real values except  $\frac{2}{3}$   
 e) all real values except  $\frac{3}{2}$

- 34 What is the inequality represented by the graph?

a)  $y > -3x - 2$       b)  $y < -3x - 2$       c)  $y \geq -3x - 2$   
 \*d)  $y \leq -3x - 2$       e)  $y > -3x + 2$



- 35 Point  $P(1, 2)$  lies on the graph of:

a)  $y = -x + 1$       b)  $y = x + 2$       c)  $x = y + 2$       \*d)  $y = 2x^2$       e)  $x = 2y^2$

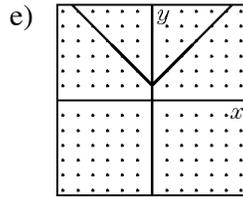
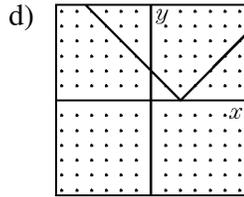
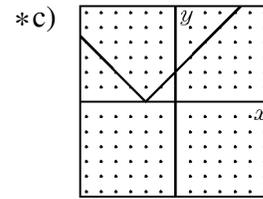
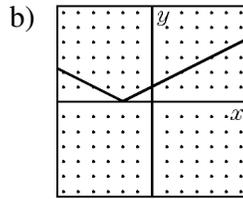
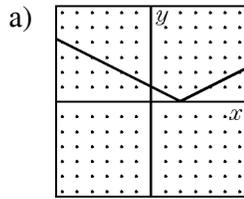
- 36 Given  $f(x) = \begin{cases} x & \text{if } x \text{ is even} \\ 2x & \text{if } x \text{ is odd} \end{cases}$

What is the value of  $f(2x) + f(2x + 1)$  when  $x$  is an odd integer?

a)  $4x$       b)  $4x + 1$       c)  $4x + 2$       d)  $6x + 1$       \*e)  $6x + 2$



42 Which of the following is the graph of  $y = |x + 2|$ ?



43 A line has slope 4. It passes through the points  $A(3, 3)$  and  $B(4, k)$ . What is the value of  $k$ ?

- a)  $-7$       b)  $-5$       c)  $-1$       \*d)  $7$       e)  $8$

44 On a graph, point  $A$  is located at  $(0, 6)$ . Point  $B$  is located 8 units below point  $A$  along the  $y$ -axis and 2 units to the left on a line parallel to the  $x$ -axis. What is the length of  $AB$ ?

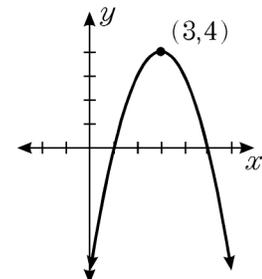
- a)  $\sqrt{60}$       \*b)  $\sqrt{68}$       c)  $\sqrt{79}$       d)  $66$       e)  $68$

45 What is the shortest distance from the point  $(3, 4)$  to the line  $x + y = 4$ ?

- a)  $3\sqrt{2}$       b)  $3$       c)  $3\sqrt{3}$       \*d)  $\frac{3\sqrt{2}}{2}$       e)  $4$

46 What is the equation of the parabola shown?

- a)  $y = -x^2 - x + 3$       b)  $y = -x^2 - 6x - 8$   
 c)  $y = -x^2 - 6x - 7$       d)  $y = -x^2 + 3x - 10$   
 \*e)  $y = -x^2 + 6x - 5$

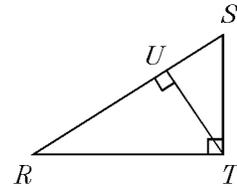


47 What is the center of the circle  $x^2 + y^2 + 4x - 14y + 37 = 0$ ?

- \*a)  $(-2, 7)$       b)  $(2, -7)$       c)  $(2, 4)$       d)  $(4, 7)$       e)  $(4, -7)$

48 In the figure,  $\angle RTS$  is a right angle and  $\overline{TU}$  is an altitude. If  $RU = 8$  and  $TU = 4$ , what is the value of  $US$ ?

- \*a) 2      b) 4      c) 8      d) 10      e) 12

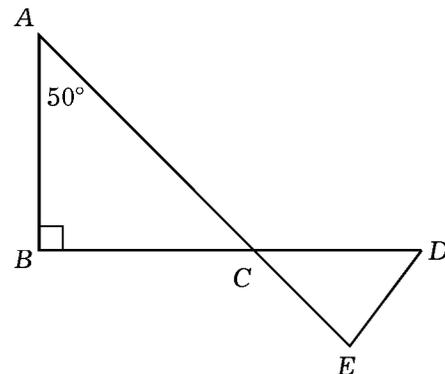


49 The lengths of the sides of  $\triangle LMN$  are 5, 6 and 7. If  $\triangle ABC \sim \triangle LMN$  and the shortest side of  $\triangle ABC$  is 15, then what is the length of the longest side of  $\triangle ABC$ ?

- a)  $10\frac{5}{7}$       b)  $12\frac{1}{2}$       c) 18      d) 20      \*e) 21

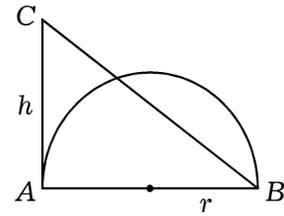
50 In the diagram,  $\overline{AB} \perp \overline{BD}$ , and  $\overline{CE} \cong \overline{ED}$ . If  $m\angle A = 50$ , what is the measure of  $\angle E$ ?

- a)  $40^\circ$       b)  $50^\circ$       c)  $70^\circ$   
d)  $80^\circ$       \*e)  $100^\circ$



- 51 The figure shows a half-circle whose diameter  $\overline{AB}$  is one leg of a right triangle. If the half-circle and triangle have the same area, what is the height of the triangle,  $h$ , in terms of radius  $r$ ?

- a)  $\pi r$       b)  $2\pi r$       c)  $\pi\sqrt{r}$       \*d)  $\frac{1}{2}\pi r$   
 e) It cannot be determined from the information given.



- 52 What is the volume of a sphere whose surface area is  $4\pi \text{ in}^2$ ?

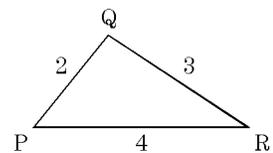
- a)  $\frac{2\pi}{3} \text{ in}^3$       \*b)  $\frac{4\pi}{3} \text{ in}^3$       c)  $\frac{8\pi}{3} \text{ in}^3$       d)  $\frac{12\pi}{3} \text{ in}^3$       e)  $\frac{16\pi}{3} \text{ in}^3$

- 53 A beach ball has a radius of 15 cm. It just fits in a box in the shape of a cube. What is the ratio of the surface area of the ball to the surface area of the box?

- a) 2 : 3      b)  $\pi : 2$       c)  $\pi : 3$       \*d)  $\pi : 6$       e)  $\pi : 30$

- 54 What is the value of  $\cos \angle PQR$ ?

- \*a)  $-\frac{1}{4}$       b)  $\frac{3}{16}$       c)  $\frac{7}{16}$       d)  $\frac{21}{16}$       e)  $\frac{29}{16}$

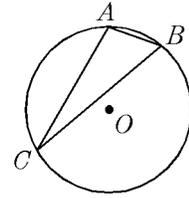


- 55 A wheel rotating at a speed of 10 revolutions per minute takes 18 seconds to travel 15 feet. What is the diameter, in feet, of this wheel?

- a)  $\frac{5}{2\pi}$       \*b)  $\frac{5}{\pi}$       c)  $\pi$       d)  $\frac{15}{\pi}$       e)  $5\pi$

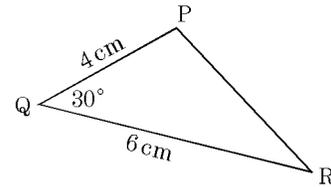
- 56  $\triangle ABC$  is inscribed in circle  $O$  as shown. If the ratio of  $m\widehat{AB} : m\widehat{AC} : m\widehat{BC} = 1 : 3 : 5$ , then what is the measure of  $\angle ABC$ ?

\*a)  $60^\circ$     b)  $100^\circ$     c)  $150^\circ$     d)  $200^\circ$     e)  $220^\circ$



- 57 In triangle  $PQR$ ,  $PQ = 4$  cm,  $RQ = 6$  cm, and  $m\angle Q = 30^\circ$ . What is the area of the triangle in square centimeters?

a)  $3\sqrt{3}$     \*b) 6    c) 3    d)  $6\sqrt{3}$     e) 12

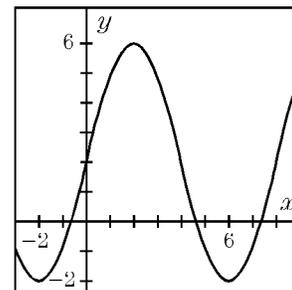


- 58 Which of the following is a point on the graph of  $f(x) = -2\sin x + 3$ ?

a)  $(\frac{3\pi}{2}, 3)$     \*b)  $(\frac{3\pi}{2}, 5)$     c)  $(\frac{\pi}{2}, 5)$     d)  $(\frac{3\pi}{2}, 1)$     e)  $(\frac{3\pi}{2}, -5)$

- 59 Given the graph of  $y = a\sin b(x + c) + d$  where  $a > 0$ , what is the value of  $c$ ?

a) 1    b)  $-\frac{\pi}{4}$     \*c) 0    d) 4    e)  $\frac{\pi}{4}$



- 60 Given  $2\sin \theta + \cot \theta = \csc \theta$ , where  $0 \leq \theta < 2\pi$ , what values for  $\theta$  satisfy the equation?

a)  $0, \frac{\pi}{2}, \frac{3\pi}{2}, \frac{\pi}{6}$     \*b)  $\frac{2\pi}{3}, \frac{4\pi}{3}$     c)  $\frac{\pi}{6}, \frac{5\pi}{6}, \frac{3}{2}\pi$   
d)  $\frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$     e)  $\frac{\pi}{2}, \frac{3\pi}{2}, \frac{\pi}{6}, \frac{5\pi}{6}$