

CCSS Math Samples — Number and Quantity

1. Let  $A = \sqrt[3]{125}$ ,  $B = \sqrt{25}$ , and  $C = \sqrt[4]{625}$ . For which of the following is the relationship true?

I.  $A > B$

II.  $B < C$

III.  $B = C$

A. I only

B. II only

C. I and II

D. III only

2. Which of the following, when simplified, results in an irrational number?

A.  $(\sqrt{2} + \sqrt{3})(\sqrt{2} - \sqrt{3})$

B.  $\frac{\sqrt{8}}{\sqrt{2}}$

C.  $(\sqrt{2} + \sqrt{3})^2$

D.  $\frac{\sqrt{3} + 2\sqrt{3}}{\sqrt{3}}$

3. Express in simplest form:

a)  $\sqrt{60} - 6\sqrt{\frac{5}{3}}$

b)  $\frac{2\sqrt{3} + 3\sqrt{2}}{\sqrt{8} - \sqrt{12}}$

c)  $\sqrt{\frac{25x^5}{y^3}}$

4. The following steps prove that the product of two rational numbers is rational. These steps are not necessarily in correct order.

1)  $\left(\frac{a}{b}\right)\left(\frac{c}{d}\right) = P$

2) let  $r = \frac{a}{b}$  and  $s = \frac{c}{d}$ , where  $a, b, c,$  and  $d$  are integers;  $b$  and  $d \neq 0$

3)  $\frac{ac}{bd} = P$

4)  $\frac{e}{f} = P$

5) let  $ac = e$  and  $bd = f$ , where  $e$  and  $f$  are integers

6)  $rs = \frac{e}{f}$

7)  $rs = P$

What is the correct order of these steps?

A. 1, 2, 3, 4, 5, 7, 6    B. 2, 1, 3, 5, 4, 6, 7

C. 7, 1, 2, 3, 4, 6, 5    D. 7, 2, 1, 3, 5, 4, 6

5. Simplify:

$$\sqrt{-25} - 4\sqrt{-9}$$

A. 0    B.  $-7i$     C.  $7i$     D.  $17i$

6. Find the product of the two complex numbers:

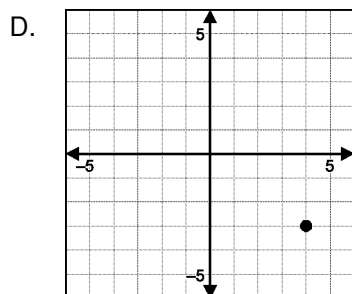
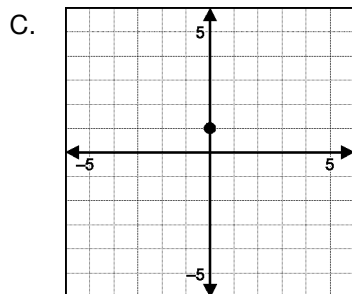
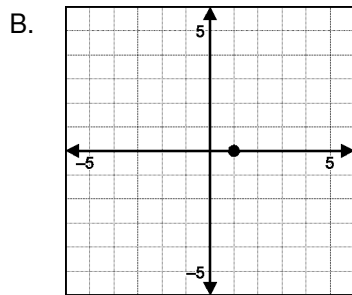
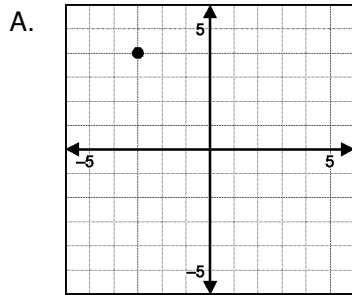
$$(3 + 2i)(2 - 7i)$$

7. Find the roots of  $x^2 + 4x + 6 = 0$

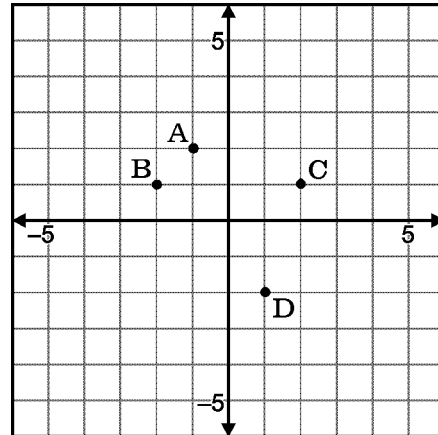
A.  $2 \pm i\sqrt{2}$     B.  $4 \pm i\sqrt{2}$

C.  $-2 \pm i\sqrt{2}$     D.  $2 \pm 2i\sqrt{2}$

8. Which of the following graphs represents the number  $i(4 + 3i)$  in the complex plane?



9. Which point shows the location of  $-2 + i$  on the complex plane?

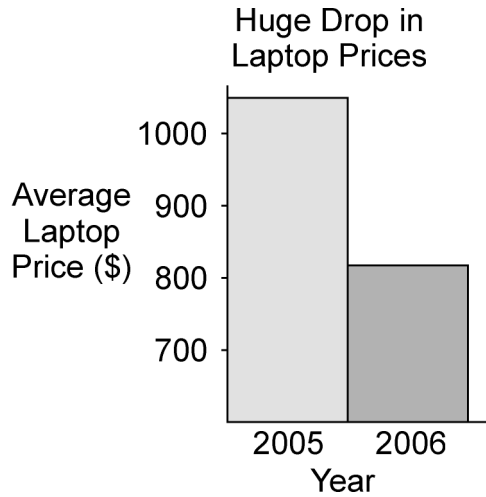


A. A      B. B      C. C      D. D

10.  $A$ ,  $B$ ,  $C$  and  $D$  are the vertices of a parallelogram on the complex plane. If  $A$  represents  $0 + 0i$ ,  $B$  represents  $5 + i$ , and  $D$  represents  $2 + 7i$ , what complex number does  $C$  represent?

- A.  $7 + 8i$                       B.  $-2 + 6i$   
 C.  $7 - 8i$                       D.  $2 - 6i$

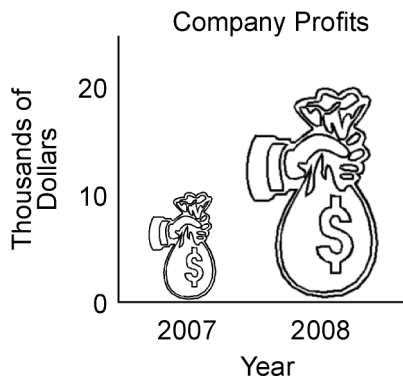
11.



What is misleading about the graph?

- A. Laptop prices seem to have tripled.
- B. Laptop prices seem to have doubled.
- C. Laptop prices seem to have been reduced in half.
- D. Laptop prices seem to have remained the same.

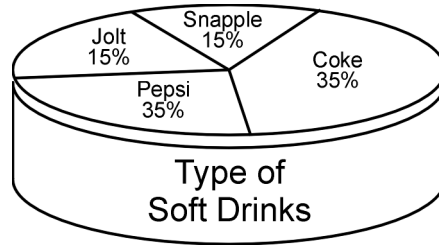
12. The pictograph compares company profits between 2007 and 2008. If the area of the two pictures is compared, instead of the height, then how many times greater are profits in 2008 than in 2007?



- A. 3 times
- B. 4 times
- C. 5 times
- D. 8 times

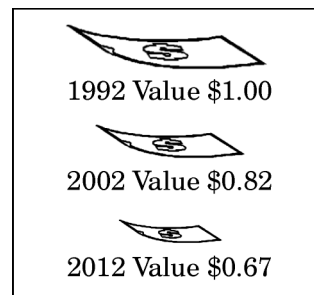
13. Select the reason(s) why the graph is misleading.

- I. there is no title
- II. the 3-D effect causes a distortion
- III. some of the segments appear to be the wrong size



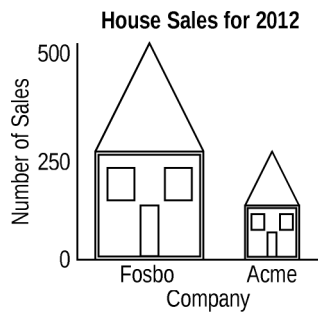
- A. I only
- B. III only
- C. I and II only
- D. I, II and III

14. The graph shows how a dollar in 2012 was worth less than a dollar in 1992.



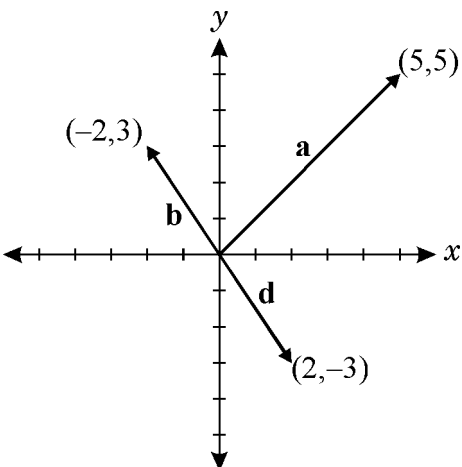
There's another period when the value of the dollar fell even faster: 1970 to 1990. During those two decades, the dollar lost nearly 75% of its value. Illustrate the decline in value with a picture of a 1970-dollar bill and a 1990-dollar bill, such that their areas are in a ratio of 4 : 1.

15.



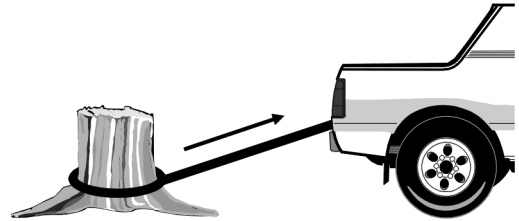
- What impression does the graph seem to convey?
- Why does the graph give the impression that it does?
- Draw a rectangle with a height of 4 cm and a width of 2 cm and let it represent the number of houses sold by the Fosbo company. What is the area of the rectangle?
- Draw a second rectangle, on a proper scale, so that its *area* represent sales of the Acme company.
- On a proper scale, how much smaller is the rectangle representing the Fosbo company than the Acme company?

16. Refer to the diagram to find the component form of  $\mathbf{a} + \mathbf{b} + \mathbf{d}$ .



- |                            |                           |
|----------------------------|---------------------------|
| A. $\langle 9, 11 \rangle$ | B. $\langle 5, 5 \rangle$ |
| C. $\langle 3, 8 \rangle$  | D. $\langle 4, 4 \rangle$ |

17. A tree trunk is pulled with a force of 3200 pounds by a truck's cable that makes an angle of  $25^\circ$  with the horizontal. What is the vertical component of the force correct to the nearest pound?



- A. 1352    B. 1423    C. 1978    D. 2900

18. Forces of 30 N to the right and 20 N downward are acting on the same object. Find the magnitude and direction of the resultant.

- 36.1 N  $56^\circ$  below the 30 N force
- 36.1 N  $56^\circ$  above the 30 N force
- 36.1 N  $34^\circ$  below the 30 N force
- 10.1 N  $34^\circ$  below the 30 N force

19. The Heavenly Shoe Store's inventory of shoes is:

*Men's Shoes:* 79 Dress, 159 Running, 119 Boots, 199 Walking

*Women's Shoes:* 199 Boots, 319 Dress, 39 Running, 119 Walking

The South Side Shoe Store's inventory of shoes is:

*Men's Shoes:* 387 Dress, 232 Boots, 309 Running, 232 Walking

*Women's Shoes:* 0 Running, 309 Boots, 154 Dress, 309 Walking

The two companies decide to merge. What is a matrix that represents the total inventory of the newly amalgamated company?

- A.  $\begin{bmatrix} 79 & 159 & 119 & 199 \\ 319 & 39 & 199 & 119 \end{bmatrix}$
- B.  $\begin{bmatrix} 387 & 309 & 232 & 232 \\ 154 & 0 & 309 & 309 \end{bmatrix}$
- C.  $\begin{bmatrix} 466 & 468 & 351 & 431 \\ 473 & 39 & 508 & 428 \end{bmatrix}$
- D.  $\begin{bmatrix} 79 & 39 & 119 & 199 \\ 319 & 159 & 199 & 119 \end{bmatrix}$

20. Solve for  $y$ :  $\begin{vmatrix} 2 & 1 & 1 \\ 5 & -1 & 1 \\ 4 & y & 1 \end{vmatrix} = 16$

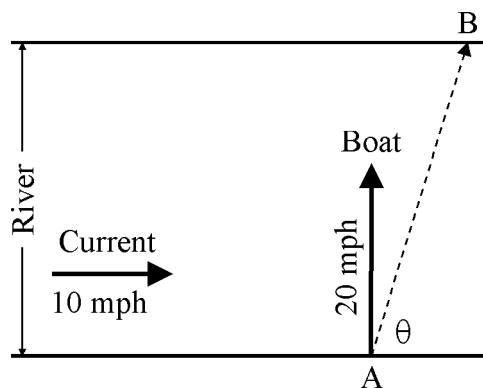
21. Triangle  $JKL$  was transformed using the following matrix calculation:

$$\begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix} \begin{bmatrix} 1 & 2 & -3 \\ -5 & 4 & 5 \end{bmatrix} + \begin{bmatrix} 4 & 0 \\ 0 & -4 \end{bmatrix} \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

What are the coordinates for  $L'$ ?

- A.  $(-2, 6)$                       B.  $(2, -6)$   
 C.  $(6, -2)$                       D.  $(-6, 2)$

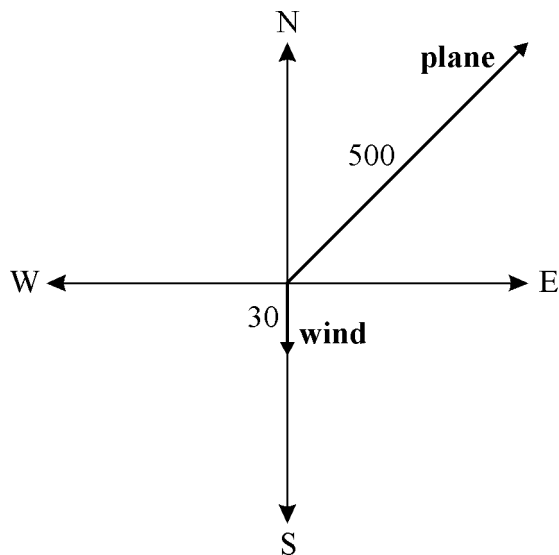
22. A boat crosses the river at a velocity of 20 miles per hour.



If the river has a current of 10 miles per hour as shown, what is the actual velocity of the boat?

- A. 18.0    B. 18.6    C. 22.4    D. 26.2

23. The diagram below represents a plane flying in a northeast direction at a velocity of 500 miles per hour. The wind is blowing from north to south at a velocity of 30 miles per hour. Find the velocity of the plane rounded to the nearest tenth of a mile per hour?



- A. 469.3                      B. 479.3  
 C. 481.5                      D. 485.1

24. The Shell Phone company produces three different types of cell phones at two different locations. The total output of cell phones in the two locations for the months of January and February is given in the tables.

January

	Model A	Model B	Model C
Location I	35	35	40
Location II	45	15	40

February

	Model A	Model B	Model C
Location I	40	35	30
Location II	10	10	5

The cost to produce each model of cell phone and the selling prices are given in the tables.

Production Costs

Model A	25
Model B	40
Model C	10

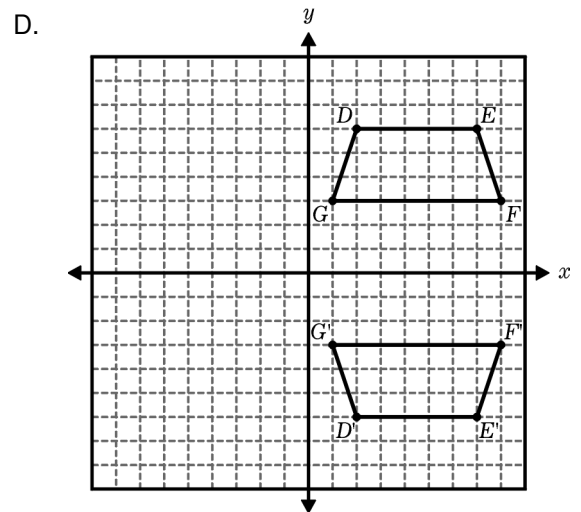
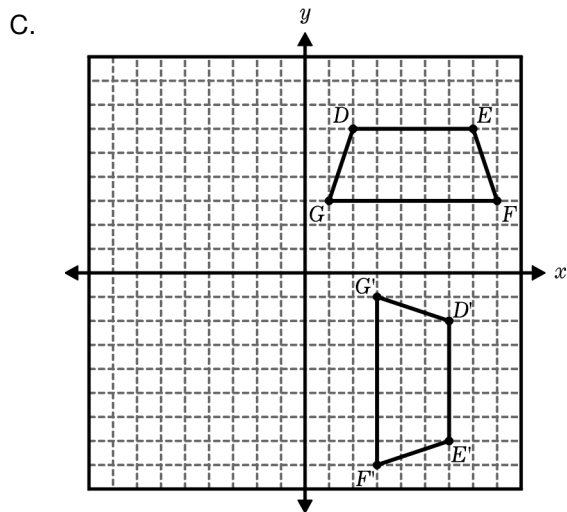
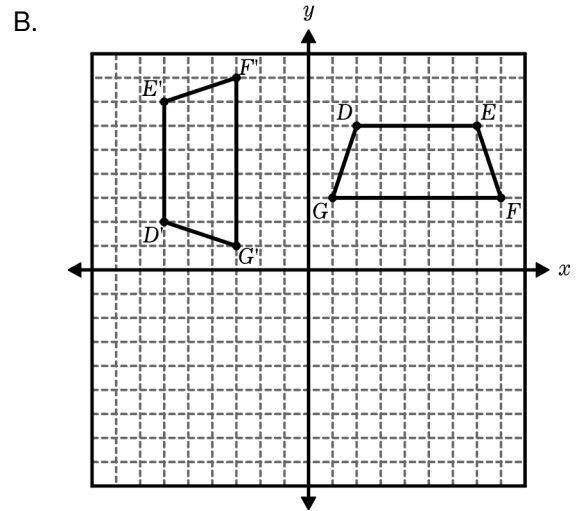
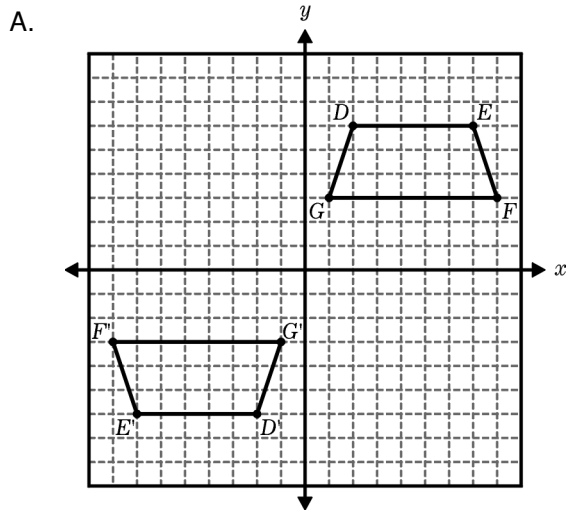
Selling Price

Model A	75
Model B	120
Model C	30

If matrix A is a  $2 \times 3$  representing the January production, matrix B is a  $2 \times 3$  matrix representing the February production, matrix C is a  $3 \times 1$  matrix representing the production costs and matrix D is a  $3 \times 1$  matrix representing the selling price, what does the matrix  $(A + B)(D - C)$  represent?

- The total profit for the month of February at each location.
- The total revenue from sales for the month of January at each location.
- The total revenue from sales for the month of February at each location.
- The total profit at each location.

25. Which graph represents the transformation matrix  $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix} \begin{bmatrix} 2 & 7 & 8 & 1 \\ 6 & 6 & 3 & 3 \end{bmatrix}$ ?



26. Stephanie and Kristina's stock holding are given in the table below.

	IBM	TI	MS	NT
Stephanie	355	266	355	0
Kristina	355	355	355	266

At the close of trade on a certain day, the prices (in dollars per share) of the stocks are \$25 for IBM, \$15 for TI, \$48 for MS, and \$16 for NT.

The data could be summarized using the following matrices:

$$M = \begin{bmatrix} 355 & 266 & 355 & 0 \\ 355 & 355 & 355 & 266 \end{bmatrix} \quad B = \begin{bmatrix} 25 \\ 15 \\ 48 \\ 16 \end{bmatrix}$$

What is the entry in row 2 column 1 of the matrix product MB?

A. 29905

B. 35496

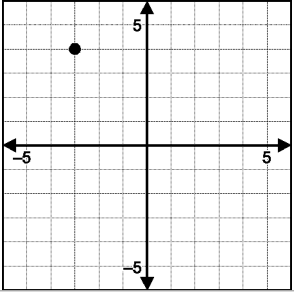
C. 27857

D. 28560

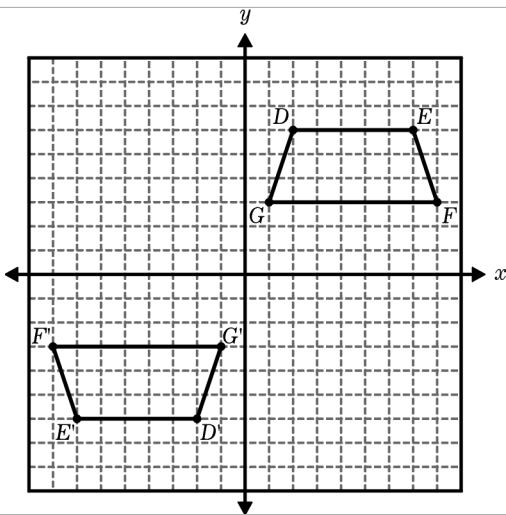


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**Number and Quantity**

Num	Scoring	Standard	Answer
1	D	N.RN.01	III only
2	C	N.RN.02	$(\sqrt{2} + \sqrt{3})^2$
3		N.RN.02	0; $\frac{-5\sqrt{6}}{2} - 6$ ; $\frac{5x^2\sqrt{x}}{y\sqrt{y}}$
4	D	N.RN.03	7, 2, 1, 3, 5, 4, 6
5	B	N.CN.02	$-7i$
6		N.CN.02	$20 - 17i$
7	C	N.CN.07	$-2 \pm i\sqrt{2}$
8	A	N.CN.05	
9	B	N.CN.04	B
10	A	N.CN.06	$7 + 8i$
11	C	N.Q.01	Laptop prices seem to have been reduced in half.
12	B	N.Q.01	4 times
13	C	N.Q.01	I and II only
14		N.Q.01	[picture]
15		N.Q.01	The houses' relative areas imply about a 75% drop in value; [pictures]; half as large.
16	B	N.VM.04A	$\langle 5, 5 \rangle$
17	A	N.VM.03	1352
18	C	N.VM.04B	36.1 N $34^\circ$ below the 30 N force
19	C	N.VM.08	$\begin{bmatrix} 466 & 468 & 351 & 431 \\ 473 & 39 & 508 & 428 \end{bmatrix}$
20		N.VM.12	5
21	A	N.VM.12	$(-2, 6)$
22	C	N.VM.03	22.4
23	B	N.VM.03	479.3
24	D	N.VM.08	The total profit at each location.

25 A N.VM.12



26 B N.VM.08 35496