1. If x varies inversely as y and x measures 12 when y is 6, find x when y is 4.

3. Given the area of a rectangle to be 360 square inches, the length of the rectangle varies inversely as the width. If the length of the rectangle is 20 square inches, what is the width?

2. If p varies inversely as q, find the missing value in the table.

p	40	30	20
q	9	?	18

4. The efficiency department of a mail and phone order company discovered the accuracy of phone orders varied inversely as the number of hours in the operator's shift. If employees who worked two-hour shifts were 98% accurate, how many hours were worked by those with 24.5% accuracy?

5. A *capacitor* stores electric charge. When three capacitors are linked in series, the total capacitance of the combination is given below, where C_1, C_2, and C_3 are the individual capacitances. Simplify this expression.
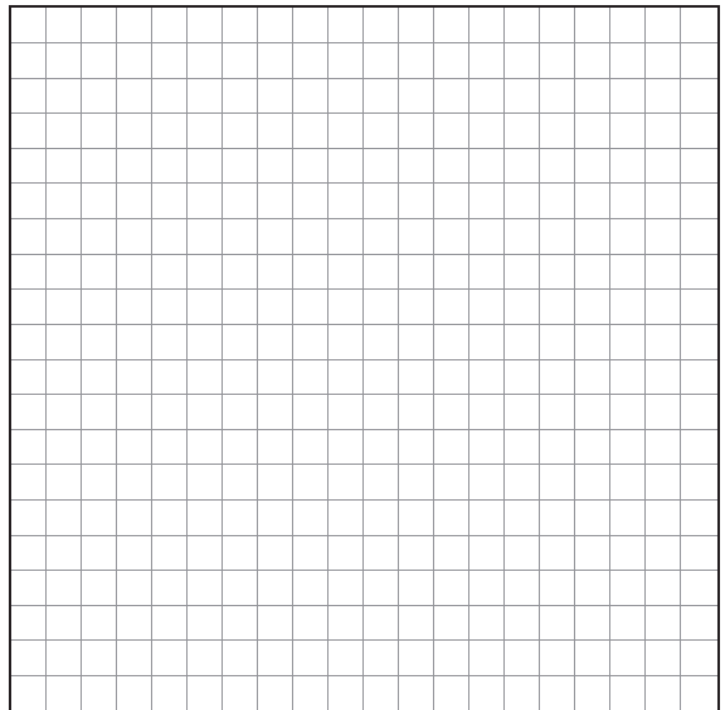
$$\frac{1}{\frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}}$$

11. Sketch the graphs of the equations:

$$4x^2 + 49(y-6)^2 = 196$$
$$4x^2 + 4y^2 = 16$$

Label the point(s) of intersection

7. A commercial artist plans to include an ellipse in a design and wants the length of the horizontal axis to equal 10 and the length of the vertical axis to equal 6. Which equation could represent this ellipse?

(1) $9x^2 + 25y^2 = 225$ (3) $x^2 + y^2 = 100$

(2) $9x^2 - 25y^2 = 225$ (4) $3y = 20x^2$

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8. When the graphs of the equations $xy = -16$ and $y = x$ are drawn on the same set of axes, what is the total number of common points?

(1) 1   (3) 3

(2) 2   (4) 0

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9. Every year a band is paid \$350 to play at the county fair. Let a represent the amount each player receives and let n represent the number of members in the band. The inverse variation relationship between a and n is best represented as

(1) $\dfrac{350}{a} = \dfrac{1}{n}$ (3) $a + n = 350$

(2) $\dfrac{n}{a} = 350$ (4) $an = 350$

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10. An architect is designing a building to include an arch in the shape of a semi-ellipse (half an ellipse), such that the width of the arch is 20 feet and the height of the arch is 8 feet, as shown in the accompanying diagram.
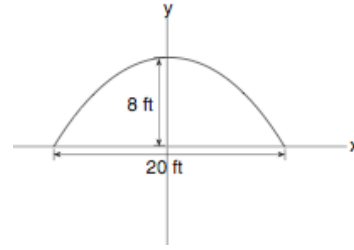
Which equation models this arch?

(1) $\dfrac{x^2}{100} + \dfrac{y^2}{64} = 1$ (3) $\dfrac{x^2}{64} + \dfrac{y^2}{100} = 1$

(2) $\dfrac{x^2}{400} + \dfrac{y^2}{64} = 1$ (4) $\dfrac{x^2}{64} + \dfrac{y^2}{400} = 1$

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11. An equation of an ellipse is

(1) $x + y = 3$ (3) $2x^2 + y^2 = 3$

(2) $x^2 + y^2 = 3$ (4) $x^2 - y^2 = 3$

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12. Abigail, who has a bionic arm, is crossing a bridge over a small gorge and decides to toss a coin into the stream below for good luck. The distance of the coin above the water can be modeled by the function

$$h(t) = -16t^2 + 96t + 112$$

where t measures time in seconds and h measures the height, in feet above the water. Graph the function on the accompanying grid. Find the greatest height the coin reaches before it drops into the water below and find the time at which the coin hits the water.