Watch for the following words:
y varies inversely as x
y is inversely proportional to x
Replace these words with the following equation:

$y = \frac{k}{x}$

Hint: Direct variation is $y = k \cdot x$
Inverse variation uses the inverse operation of multiplication: Division by x

Ex 1) Find the constant of variation where y varies inversely with x, and y = 32 when x = 0.2.

$$y = \frac{k}{x}$$

$$32 = \frac{k}{0.2}$$

$$0.2 \cdot 32 = \frac{k}{0.2} \cdot 0.2$$

$$6.4 = k$$

Ex 2) If y is inversely proportional to x, and y = 6 when x = 5, find x when y = 12.

(I)

$$y = \frac{k}{x}$$

$$6 = k/5$$

$$5 \cdot 6 = k/5 \cdot 5$$

$$k = 30$$

(II)

$$y = \frac{30}{x}$$

$$12 = \frac{30}{x}$$

$$\frac{12}{1} = \frac{30}{x}$$

$$\frac{12x}{12} = \frac{30}{12}$$

$$x = 2.5$$

Joint variation is nothing more than the product of 2 or more direct variations.

If you see words like:

y varies jointly with x and z

y is jointly proportional to x and z

Replace these words with:

$y = k \times z$

Ex 3) If z varies jointly as x and the square root of y, and $z = 6$ when $x = 3$ and $y = 16$, find z when $x = 7$ and $y = 4$.

(I) $z = k \cdot x \cdot \sqrt{y}$

$6 = k \cdot 3 \cdot \sqrt{16}$

$6 = k \cdot 3 \cdot 4$

$\frac{6}{12} = \frac{12k}{12}$

$k = 0.5$

(II) $z = 0.5 \times \sqrt{y}$

$z = (0.5)(7)(\sqrt{4})$

$z = (0.5)(7)(2)$

$z = 7$

Sometimes we will have a problem that is directly proportional to one variable and inversely proportional to another variable.

Ex 4) The electrical resistance of a wire varies directly as its length and inversely as the square of its diameter. One hundred meters of wire with a diameter of 6 mm has a resistance of 12 ohms. Eighty meters of a second wire of the same material has a resistance of 15 ohms. Find the diameter of the second wire.

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(I) $R = \frac{K \cdot L}{d^2}$

$12 = \frac{K \cdot 100}{6^2}$

$12 = \frac{100K}{36}$

$\frac{36}{100} \cdot 12 = \frac{100K}{36} \cdot \frac{36}{100}$

$K = 4.32$

(II) $R = \frac{4.32L}{d^2}$

$15 = \frac{(4.32)(80)}{d^2}$

$\frac{15}{1} = \frac{345.6}{d^2}$

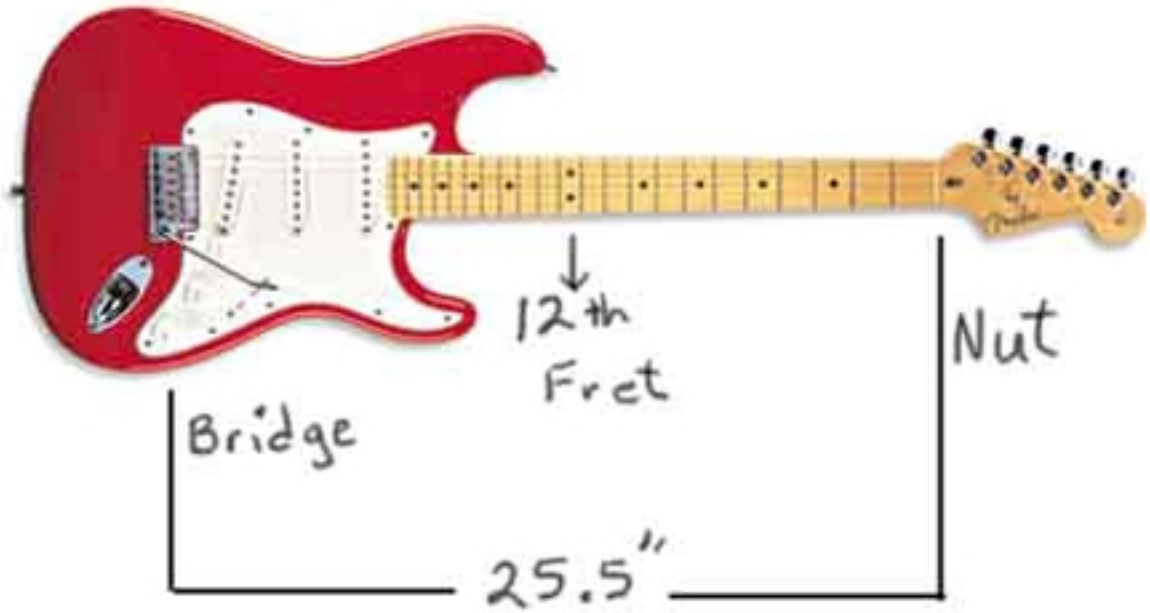
$\frac{15d^2}{15} = \frac{345.6}{15}$

$d^2 = 23.04$

$\sqrt{d^2} = \sqrt{23.04}$

$d = 4.8$ mm

Ex) Guitar Mathematics:
The frequency of a string under constant tension is inversely proportional to its length. A Fender Stratocaster has a string length for an open string that is 25.5" long. The sixth string vibrates 82.407 times per second (Hz). What length must the string be to vibrate 110.000 times per second (Hz). For EC, what fret is this? Also, what is the name of the musical note?



American Stratocaster® Specifications	
Fingerboard:	Rosewood or maple (9.5" Radius/241 mm)
Scale Length:	25.5" (648 mm)
Width at Nut:	1.6875" (43 mm)

Thanks to Fender.com for this information.
www.fender.com