CALCULATING PERCENT INCREASE AND DECREASE

- Want more practice with percents and related concepts?
  Changing Decimals to Percents
  Changing Percents to Decimals
  Writing Expressions Involving Percent Increase and Decrease
  Problems Involving Percent Increase and Decrease
  More Problems Involving Percent Increase and Decrease

(more mathematical cats)

When a quantity grows (gets bigger), then we can compute its PERCENT INCREASE.

When a quantity shrinks (gets smaller), then we can compute its PERCENT DECREASE.

These concepts are thoroughly explored on this page.

Percent Increase

When a quantity grows (gets bigger), then we can compute its PERCENT INCREASE:

$$\text{PERCENT INCREASE} = \frac{(\text{new amount} - \text{original amount})}{\text{original amount}}$$

Some people write this formula with 100% at the end,
to emphasize that since it is ***percent*** increase, it should be ***reported as a percent***.

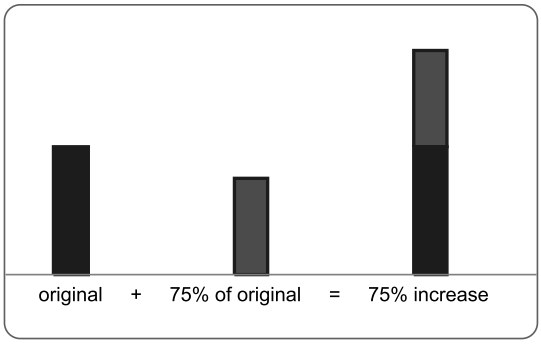
So, here's an alternate way to give the formula:

$$\text{PERCENT INCREASE} = \frac{(\text{new amount} - \text{original amount})}{\text{original amount}} \cdot 100\%$$

Recall that $100\% = 100 \cdot \frac{1}{100} = 1$.
So, 100% is just the number 1!
Multiplying by 1 doesn't change anything except the ***name*** of the number!
(See examples below.)

By the way, there's a very optimistic percent T-shirt here.
Wear it and watch people smile!

Visualizing Percent Increase



percent to increase by: 75

Type a nonnegative number in the box above, and then:

Click to change

NOTE:
If percent increase $= 75\%$,
then the formula

$$\text{percent increase} = \frac{(\text{new} - \text{original})}{\text{original}}$$

becomes

$$75\% = \frac{(\text{new} - \text{original})}{\text{original}}$$

and solving for 'new' gives:

$$\text{new} = \text{original} + 75\%(\text{original})$$

Percent Decrease

When a quantity shrinks (gets smaller), then we can compute its PERCENT DECREASE:

$$\text{PERCENT DECREASE} = \frac{(\text{original amount} - \text{new amount})}{\text{original amount}}$$

OR

$$\text{PERCENT DECREASE} = \frac{(\text{original amount} - \text{new amount})}{\text{original amount}} \cdot 100\%$$

Both formulas have the following pattern:

$$\text{PERCENT INCREASE/DECREASE} = \frac{\text{change in amount}}{\text{original amount}}$$

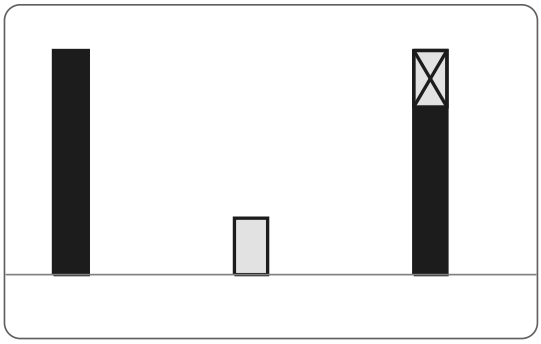
OR

$$\text{PERCENT INCREASE/DECREASE} = \frac{\text{change in amount}}{\text{original amount}} \cdot 100\%$$

Note that when you compute percent increase or decrease,
you always compare how much a quantity has changed to the **original** amount.

Note also that the numerator in these formulas is always a POSITIVE number
(or zero, if the quantity doesn't change at all).

Visualizing Percent Decrease



percent to decrease by: 25

Type a number between 0 and 100 in the box above, and then:

Click to change

NOTE:
If percent decrease $= 25\%$,
then the formula

$$\text{percent decrease} = \frac{(\text{original} - \text{new})}{\text{original}}$$

becomes

$$25\% = \frac{(\text{original} - \text{new})}{\text{original}}$$

and solving for 'new' gives:

$$\text{new} = \text{original} - 25\%(\text{original})$$

EXAMPLES:

Question: A price rose from \$5 to \$7. What percent increase is this?
Solution: Which is the **original** price? Answer: \$5
This will be the denominator.

$$\%\ \text{increase} \ = \ \frac{(7-5)}{5} \ = \ \frac{2}{5} \ = \ 0.40 \ = \ 40\%$$

OR

$$\%\ \text{increase} \ = \ \frac{(7-5)}{5} \cdot 100\% \ = \ \frac{2}{5} \cdot 100\% \ = \ 2 \cdot \frac{100}{5}\% \ = \ 2 \cdot 20\% \ = \ 40\%$$

Notes:

- No matter which version of the formula you choose to use,
  be sure to give your answer as a PERCENT.
- The units have been suppressed (left out) in the calculations above.
  This is common practice when it is ***known*** that units will cancel,
  since it makes things look simpler.

  Here is the same result, with the units in place:

$$\%\text{ increase} \quad = \quad \frac{\$7 - \$5}{\$5} \quad = \quad \frac{\$2}{\$5} \quad = \quad \overbrace{\frac{2}{5}}^{\text{units have cancelled}} \quad = \quad 0.40 \quad = \quad 40\%$$

  In a correct use of the formulas for percent increase and decrease,
  the units of the numerator and denominator will always be the same,
  so the units will always cancel.

Question: A quantity decreased from 90 to 75. What percent decrease is this?
Solution: Which is the **original** quantity? Answer: 90
This will be the denominator.

$$\%\text{ decrease} \;=\; \frac{(90 - 75)}{90} \;=\; \frac{15}{90} \;\approx\; 0.1667 \;=\; 16.67\%$$

Note: In the exercises below, if an answer does not come out exact, then it is rounded to two decimal places.

Question: An item went on sale for \$13 from \$16. What percent decrease is this?
Solution: Which is the **original** price? Answer: \$16
This will be the denominator.

$$\%\text{ decrease} \;=\; \frac{(16 - 13)}{16} \;=\; 0.1875 \;=\; 18.75\%$$