2.10 Change Expressed as a Percent Notes

Percent of Change: when an increase or decrease is expressed as a percent (amount of change as a percent of the original number)

Formula: $\frac{amount\ of\ increase\ or\ decrease}{original\ amount}$ **OR** $\frac{amount\ of\ change}{original\ amount}$

Percent of Increase: if the new amount is greater than the original amount

Examples: tax

Formula: $\frac{new\ amount - original\ amount}{original\ amount}$

*Review Problem 2 on page 145

*Got it? #2 $\frac{\$3.50 - 3}{3} = \frac{.5}{3} = 0.166$ or 17%

Percent of Decrease: if the new amount is less than the original amount

Examples: discount

Formula: $\frac{original\ amount - new\ amount}{original\ amount}$

*Review Problem 1 on page 145

*Got it? #1

$\frac{4.1 - 2.8}{4.1} = \frac{1.3}{4.1} = 0.317$ or 32%

2.10 Change Expressed as a Percent

* Review: A percent is a ratio that compares a number to 100.
: You can describe each change as an increase or decrease.
Ex:
A) 72 to 84 ⇒ increase
B) 25 to 16 ⇒ decrease
C) $0.99 to $1.02 ⇒ increase

Relative error: the ratio of the absolute value of the difference of a measured (or estimated) value and an actual value compared to the actual value

Percent error: when relative error is expressed as a percent. It tells you how accurate a measurement or estimate is.

Formula: $\frac{|\text{measured or estimated value} - \text{actual value}|}{\text{acutal value}}$

* why is the absolute value signs used? You are not concerned whether the estimate is over or under the actual value. The absolute value ensures a positive result.

*Review Problem 3 on page 146

*Got it? #3

Actual = 4.75 mi.
Estimate = 5.5 mi.

$$\frac{|4.75 - 5.5|}{4.75} = \frac{|-0.75|}{4.75} = \frac{.75}{4.75} = 0.157$$ ← relative error

or

16% ← percent error

*Review Problem 4 on page 147

*Got it? #4

Minimum height = measured value − possible error = 66 − 0.5 = 65.5 in

Maximum height = measured value + possible error = 66 + 0.5 = 66.5 in.

* the greatest possible error in a measurement is ½ of the measuring unit

*Review Problem 5 on page 147

*Got it? #~~4~~ 5 on page 148

Measured volume = (12)(6)(5) = 360
Minimum volume = (11.75)(5.75)(4.75) ≈ 320.9
Maximum volume = (12.25)(6.25)(5.25) ≈ 402

|Min. volume − measured volume| = |320.9 − 360| = 39.1
|Max. volume − measured volume| = |402 − 360| = 42

* Use the greater difference in order to find the greatest possible error

* greatest possible % error = $\frac{40.2 - 360}{\text{measured}} = \frac{42}{360} = 0.116$ or (11.2%)

2.10 pg. 148 #8-30 even

(8) $\frac{9-6}{9} = 0.33 \approx 33\%$ decrease

(10) $\frac{9.5-7.5}{7.5} = \frac{2}{7.5} = 0.2\overline{6} \approx 27\%$ increase

(12) $\frac{2008-1975}{2008} = \frac{33}{2008} = 0.016 \approx 2\%$ decrease

(14) $\frac{215.25-195.50}{195.50} = \frac{19.75}{195.50} = 0.101 \approx 10\%$ increase

(16) $\frac{8.75-8}{8} = \frac{.75}{8} = 0.093 \approx 9\%$

(18) $\frac{|6.5-8|}{6.5} = \frac{1.5}{6.5} \approx 23\%$

measured value +/- possible error

(20) Min. weight = 162 - 0.5lb = 161.5lb
Max weight = 162 + 0.5lb = 162.5lb

(22) Min. 0.4mm - 0.05 = 0.35 mm
Max. 0.4mm + 0.05 = 0.45 mm

7.5-0.25

7.5+0.25

(24) $A = l \cdot w$

Measured area $= 7.5(18.5) = 138.75$

Min. area $= (7.25)(18.25) \approx 132.31$

Max area $= (7.75)(18.75) \approx 145.31$

↑ greater difference

$|\text{Max. volume} - \text{measured volume}| = |145.31 - 138.75|$

6.56

greatest possible % error $= \frac{6.56}{138.75} = 0.047$

$\approx$ 5%

(26) $\frac{22.25 - 18}{18} = \frac{4.25}{18} = 0.236 \approx$ 24% increase

(28) $\frac{15.99 - 8.99}{8.99} = \frac{7}{8.99} = 0.778$

$\approx$ 78% increase

(30) $\frac{\$4023.52 - 982.13}{4023.52} = \frac{3041.39}{4023.52} = 0.755$

$\approx$ 76% ↓

(32) $A = l \cdot w$

greatest

Measured area $= (18)(15) = 270$

Min. area $= (17.5)(14.5) = 253.75\ in^2$

Max. area $= (18.5)(15.5) = 286.75\ in^2$

$|\text{Max} - \text{measured}| = |286.75 - 270| = 16.75$

% of error $= \frac{16.75}{270} = 0.062 \approx 6\%$