13th November

Completed Exercises from the lecture on

< Ratios, Rates, Proportions & Units >

1. Medium, Pages 2-5;

2. Hard, Pages 6-9;

Can be found below.

Medium

(1) **d28c29e1** MULTIPLE CHOICE One answer only

The International Space Station orbits Earth at an average speed of 4.76 miles per second. What is the space station's average speed in miles per hour?

a. $17,136.0$
b. 285.6
c. 571.2
d. 856.8

1 hour = 60 x 60 seconds

4.76 m/s

(2) **b4912cc5** MULTIPLE CHOICE One answer only

The population density of Iceland, in people per square kilometer of land area, increased from 2.5 in 1990 to 3.3 in 2014. During this time period, the land area of Iceland was 100,250 square kilometers. By how many people did Iceland's population increase from 1990 to 2014?

a. 132,330
b. 125,312
c. 80,200
d. 330,825

1990: 2.5 P/Km² } $\frac{\#\ P}{100,250\ Km^2}$ = P/Km²

2014: 3.3 P/Km² }

1990 { $\frac{\#\ P}{100,250\ Km^2} = 2.5\ P/Km^2$

$\#\ (2.5)\ P/\cancel{Km^2}\ \ 100,250\ \cancel{Km^2} = 250625\ P$

$\frac{\#\ P}{100,250\ Km^2} = 3.3\ P/Km^2$

$\Rightarrow\ \#\ = 3.3\ P/\cancel{Km^2}\ \ 100,250\ \cancel{Km^2} = 330625$

(3) **8e528129** SHORT ANSWER Case-Insensitive

Pure beeswax has a density of 0.555 ounce per cubic inch. An online company sells pure beeswax at a price of \$8.00 per ounce. What is the selling price, in dollars per cubic inch, for pure beeswax purchased from this company?

$d_b = 0.555 \ \frac{\text{oz}}{\text{in}^3}$ $\qquad b = 8 \ \frac{\$}{\text{oz}}$

$$\frac{\cancel{\text{oz}}}{\text{in}^3} \cdot \frac{\$}{\cancel{\text{oz}}} = \frac{\$}{\text{in}^3}$$

$= 8(0.555)\$ \ / \ \text{in}^3$

$= 4.44 \ \$$

$25.384 \approx 25.4$ (10th)

(4) **fea831fc** SHORT ANSWER Case-Insensitive

On April 18, 1775, Paul Revere set off on his midnight ride from Charlestown to Lexington. If he had ridden straight to Lexington without stopping, he would have traveled 11 miles in 26 minutes. In such a ride, what would the average speed of his horse have been, to the nearest tenth of a mile per hour?

Ch Le

25.4

60 minutes = 1 hour

$\Rightarrow$ minutes = $\frac{1}{60}$ hour

miles/hour

$$\frac{11 \text{ miles}}{26 \text{ minutes}} = \frac{11 \text{ miles}}{26 \cdot \frac{1}{60} \text{ hour}} = \frac{11}{26 \cdot \frac{1}{60}} \cdot \frac{\text{miles}}{\text{hour}}$$

Hard

(1) **c9fb15ad** MULTIPLE CHOICE One answer only

Species of tree	Growth factor
Red maple	4.5
River birch	3.5
Cottonwood	2.0
Black walnut	4.5
White birch	5.0
American elm	4.0
Pin oak	3.0
Shagbark hickory	7.5

One method of calculating the approximate age, in years, of a tree of a particular species is to multiply the diameter of the tree, in inches, by a constant called the growth factor for that species. The table above gives the growth factors for eight species of trees. If a white birch tree and a pin oak tree each now have a diameter of 1 foot, which of the following will be closest to the difference, in inches, of their diameters 10 years from now? (1 foot = 12 inches)

a. 1.3
b. 1.2
c. 1.0
d. 1.4

d_t inches $\cdot$ $g_f \simeq$ years

$d_{wb} - d_{po} = \frac{10}{5} - \frac{10}{3} = \frac{6}{3} - \frac{10}{3} = -\frac{4}{3}$

d_{wb} inches $\cdot$ 5 $=$ 10 years $\Rightarrow \frac{10}{5}$ in $= d_w$

d_{po} inches $\cdot$ 3 $=$ 10 years $\Rightarrow \frac{10}{3}$ in $= d_{po}$

(2) **3638f413** SHORT ANSWER Case-Insensitive

Jeremy deposited x dollars in his investment account on January 1, 2001. The amount of money in the account doubled each year until Jeremy had 480 dollars in his investment account on January 1, 2005. What is the value of x ?

$2 \times 2 \times 2 \times 2 (x) = \$480$

$2^4 (x) = \$480$

2001: x) $\times 2$

2002: $2x$) $\times 2$

2003: $4x$) $\times 2$

2004: $8x$) $\times 2$

2005: 480 \$ $= 16x \Rightarrow \boxed{x = 30}$

(3) **3f775bbf** MULTIPLE CHOICE One answer only

State	Power capacity			
	Low	Medium	High	Total
Texas	4	2	3	9
California	1	0	1	2
Oregon	1	0	1	2
Indiana	0	2	0	2
Colorado	1	1	0	2
Iowa	2	0	0	2
Oklahoma	1	0	0	1
Total	10	5	5	20

The table shows the distribution, by location and power capacity (maximum rate of power generation) of the twenty largest wind projects in the United States in 2013. The total power capacity of the nine wind projects located in Texas was 4,952 megawatts (MW), and the total power capacity of the twenty wind projects was 11,037 MW in 2013. The amount of energy produced in one hour at a rate of one megawatt is one megawatt-hour. If each of the nine Texas wind projects in 2013 had operated continuously for 24 hours at the maximum rate of power generation, approximately how many megawatt-hours of energy would the nine projects have produced?

a. 120,000
b. 11,000
c. 5,000
d. 200

$4{,}952 \times 1 \text{ hour} = 4952 \text{ MW-H}$

$\frac{4{,}952}{9 \text{ projects}} \times 24 \text{ hours} =$

(4) **8637294f** SHORT ANSWER Case-Insensitive

If $\frac{4a}{b} = 6.7$ and $\frac{a}{bn} = 26.8$, what is the value of n?

$n =$ $\Rightarrow n =$

$n \cdot \frac{a}{bn} = 26.8$ $\times n$ $\Rightarrow \frac{a}{b} = 26.8 \cdot n$ $\times \frac{1}{26.8}$

$$\Rightarrow n = \frac{a}{b} \cdot \frac{1}{26.8} \quad ?$$

$\frac{1}{4} \cdot \frac{4a}{b} = 6.7$ $\times \frac{1}{4}$ $\Rightarrow \frac{a}{b} = \frac{6.7}{4}$

$$\Rightarrow n = \frac{6.7}{4} \cdot \frac{1}{26.8} = 0.0625 = \frac{1}{16}$$

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