### Exam 4 Selected Problems

**Previous Year's Test** (online)

#3 For the slope between $(2, 4)$ and $(5, b)$ to be negative, $b$ must be .....?

$$m = \text{slope} = \frac{\Delta y}{\Delta x} = \frac{y_2-y_1}{x_2-x_1} = \frac{b-4}{5-2} = \frac{b-4}{3}.$$  

For this expression to be negative, the numerator must be negative (since the denominator is $+3$).

Therefore $b - 4 < 0$ or $b < 4$\(\square\) answer "d".

#4 If the slope of the line segment joining $(-2, 1)$ and $(x, 3)$ is 2, what is $x$?

$$m = \text{slope} = \frac{\Delta y}{\Delta x} = \frac{y_2-y_1}{x_2-x_1} = \frac{3-1}{x-(-2)} = \frac{2}{x+2}.$$  

For this expression to be equal to 2, the denominator must be equal to 1.

$$\frac{2}{x+2} = 2 \quad \rightarrow \quad 2 = 2(x+2) \quad \rightarrow \quad 1 = x + 2 \quad \rightarrow \quad x = -1\square$$  

answer "a"

### Lesson 13:

#7 A grade of 6% means that for each 100 feet of run ($x$ – direction) there is a 6 feet rise ($y$ – direction). Therefore this is a situation where one can use similar triangles.

$$\frac{x}{6} = \frac{5280}{100} \quad \rightarrow \quad x = 6 \cdot \frac{5280}{100} = 316.8 \text{ ft} \square$$
Lesson 14:

#10 We use  
a) vertical angles   
b) supplementary angles

\[
\begin{align*}
\text{Vertical angles} & \quad y = 2x \\
\text{are identical} & \quad w = y \text{ and } z = x
\end{align*}
\]

Since the angles \( x \) and \( 2x \) form a straight line, they must add to \( 180^\circ \). Therefore, \( 3x = 180 \) or \( x = 60 \).

If \( x = 60 \), then \( y = 120, w = 120 \) and \( z = 60 \).

#14  
a) True: if \( \alpha + \beta = 90^\circ \), then \( 2\alpha + 2\beta = 2(\alpha + \beta) = 2(90^\circ) = 180^\circ \)

This means that \( 2\alpha \) and \( 2\beta \) are supplementary.

b) False: Vertical angles are always equal to each other. Only if they are each \( 90^\circ \) are they supplementary.

c) True: An acute angle is less than \( 90^\circ \). It's complement must be large enough to add up to \( 180^\circ \). Therefore, its complement must be bigger than \( 90^\circ \). An angle that is bigger than \( 90^\circ \) is called obtuse.

g) True: Assume a circular pie crust. The distance around the edge of the circle is the circumference (or perimeter). It's value is \( 2\pi r \) where \( r \) is the radius of the circle.

Re-arrange that expression a little: \( 2\pi r = (2r)\pi = (D)\pi \) where \( D \) is the diameter of the circle.

This says that the length of the pie crust is \( \pi \) times diameter of the pie. Pi (\( \pi \approx 3.1415... \)) is larger than 3, therefore the pie crust is more than 3 times the diameter.
Lesson 15:

#3. We'll draw two similar triangles

Now set the ratios that we know are equal in similar triangles:

\[
\frac{x''}{134 \text{ m}} = \frac{2.3''}{1.6''} \rightarrow x = \frac{2.3''}{1.6''} \times 134 \text{ m} \approx 193 \text{ m}
\]

\[
\frac{y''}{134 \text{ m}} = \frac{1.4''}{1.6''} \rightarrow x = \frac{1.4''}{1.6''} \times 134 \text{ m} \approx 117 \text{ m}
\]

#4 For clarity, I have drawn the two triangles below:

We will use the two heights (3 and 6) as our keystone on which we will construct our solution.

Small triangle: \( \frac{3}{y} \) Large triangle: \( \frac{6}{8+y} \)

\[
\frac{3}{y} = \frac{6}{8+y} \rightarrow 3(8 + y) = 6y \quad \{ \text{multiplied both sides by } (8 + y) \text{ and } y \} \\
24 + 3y = 6y \\
24 = 3y \\
8 = y
\]

Now that we have \( y \) we can get \( x \) in the small triangle .... which then means we can get \( z \).