DO NOW On the back of this packet

☐ (1) **Similar Right Triangles: Opposite**
   1. Name the side of the triangle opposite ∠A. __________
   2. Name the side of the triangle opposite ∠B. __________
   3. Name the side of the triangle opposite ∠C. __________

☐ (2) **Similar Right Triangles: Opposite, Hypotenuse, and Adjacent**
   For each diagram, label the appropriate sides as opposite, and hypotenuse, with respect to the marked acute angle (reference angle).

One side of each triangle isn’t labeled. Label it “adjacent” now. Adjacent means “next to.” Adjacent sides are next to the reference angle.
Similar Right Triangles: adjacent/hypotenuse (cosine of the reference angle)

Observe the diagram at right.

☐ (a) How many triangles do you see? _________

☐ (b) How many of those triangles are similar? _________ Explain.

☐ (c) Write 4 “within triangle” ratios, one for each triangle. Write the ratios so their values are all less than one.

with letters:

_______    _______   _______   _______

with numbers:

_______    _______   _______   _______

as a decimal:

_______    _______   _______

☐ (d) What do you notice about all of the ratios you wrote for part (c)? __________________________

☐ (e) Would the ratios still be equal if the triangles were floating apart from one another in the plane? _________

☐ (f) Is angle Q the same measure for all of the triangles? _____ because _______________________________

☐ (g) Angle Q is our reference angle. Mark it.
That means 10, 15, 20, and 45 are each the ____________________________of a triangle.

AND 6, 9, 12, and 27 are all ____________________________ sides.

☐ (h) Based on what you wrote in part (g), all of the ratios you wrote for part (c) relate the __________________________
to the ____________________________ which were written ____________________________.

☐ (i) Angle Q in the diagram is 53.13°.
The ratio adjacent/hypotenuse for all of the triangles in the diagram is _________.
ALL right triangles with a 53.13° reference angle will have adjacent/hypotenuse ratios that are equal to _______.

Type \( \cos(53.13°) \) into your calculator. Do you get the same decimal value you did in part c?_________
That is because, you are saying to your calculator: “Hey, calculator. I have this triangle with a 53.13° angle and I want to know the ratio of the adjacent side to the hypotenuse. What is it?” The way you ask all of this is to type: \( \cos(53.13) \)
Similar Right Triangles: opposite/hypotenuse (sine of the reference angle)

Observe the diagram at right.

(c) Write 4 “within triangle” ratios, one for each triangle. Write the ratios so their values are all less than one.

with letters:

with numbers:

as a decimal:

(d) What do you notice about all of the ratios you wrote for part (c)?

(e) Would the ratios still be equal if the triangles were floating apart from one another in the plane?

(f) Is angle Q the same measure for all of the triangles? Yes because ______________________________

(g) Angle Q is our reference angle. Mark it. That means 10, 15, 20, and 45 are each the ____________________ of a triangle.

AND 8, 12, 16, and 36 are all __________________________ sides.

(h) Based on what you wrote in part (g), all of the ratios you wrote for part (c) relate the ____________

to the ____________ which were written ____________.

(i) Angle Q in the diagram is 53.13°.

The opposite/hypotenuse ratio for all of the triangles in the diagram is __________.

ALL right triangles with a 53.13° reference angle will have opposite/hypotenuse ratios that are equal to _____

Type sin(53.13°) into your calculator. Do you get the same decimal value you did in part c? Yes

That is because, you are saying to your calculator: “Hey, calculator. I have this triangle with a 53.13° angle and I want to know the ratio of the opposite side to the hypotenuse. What is it?” The way you ask all of this is to type: sin(53.13°)
4

Similar Right Triangles: opposite/adjacent (tangent of the reference angle)

□ Observe the diagram below.

□ (c) Write 4 “within triangle” ratios, one for each triangle.
   Write the ratios so their values are all greater than one.

   with letters:

   _______  _______  _______  _______

   with numbers:

   _______  _______  _______  _______

   as a decimal:

   _______  _______  _______  _______

□ (d) What do you notice about all of the ratios you wrote for part (c)?

□ (e) Would the ratios still be equal if the triangles were floating apart from one another in the plane? __________

□ (f) Is angle Q the same measure for all of the triangles? ______ because _______________________________

□ (g) Angle Q is our reference angle. Mark it.
   That means 8, 12, 16, and 36 are each the ________________________________ of a triangle.

   AND 6, 9, 12, and 27 are all ________________________________ sides.

□ (h) Based on what you wrote in part (g), all of the ratios you wrote for part (c) relate the __________________

   to the ________________, which were written ____________________________.

□ (i) Angle Q in the diagram is 53.13°.
   The opposite/adjacent ratio for all of the triangles in the diagram is _______.

   ALL right triangles with a 53.13° reference angle will have opposite/adjacent ratios that are equal to _____

   Type tan(53.13°) into your calculator. Do you get the same decimal value you did in part c?__________
   That is because, you are saying to your calculator: “Hey, calculator. I have this triangle with a 53.13° angle
   and I want to know the ratio of the opposite side to the adjacent side. What is it?” The way you ask all of this
   is to type: tan(53.13)
Similar right triangles: Summary

In the diagram of triangle DEF,

- the reference angle is ____________
- the opposite side is __________
- the hypotenuse is __________
- the adjacent side is __________

Label the reference angle, opposite, hypotenuse, and adjacent in the diagram.

Right triangles with congruent reference angles are ________________________________

Because right triangles with congruent reference angles are ________________________________ we can use the reference angle and a calculator to find the values for the ratios of pairs of sides. Sine, cosine, and tangent give us ratios comparing different sides.

<table>
<thead>
<tr>
<th>parts (opp, hyp, adj)</th>
<th>side names (DE, EF, FD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>sin $\angle D$ = ________________</td>
<td>sin $\angle D$ = ________________</td>
</tr>
<tr>
<td>cos $\angle D$ = ________________</td>
<td>cos $\angle D$ = ________________</td>
</tr>
<tr>
<td>tan $\angle D$ = ________________</td>
<td>tan $\angle D$ = ________________</td>
</tr>
</tbody>
</table>
Exit Ticket
ON THE LAST PAGE

Homework

Opposite side = 
Adjacent side = 
Hypotenuse = 

Opposite side = 
Adjacent side = 
Hypotenuse = 

Opposite side = 
Adjacent side = 
Hypotenuse = 

Opposite side = 
Adjacent side = 
Hypotenuse =
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Homework</strong></td>
<td></td>
</tr>
<tr>
<td>Label the opposite, hypotenuse, and adjacent for each triangle.</td>
<td></td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>7.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>8.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>9.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>10.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>11.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>12.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
8

(8) Homework

Steve drew line segments $ABCD$, $EFG$, $BF$, and $CF$ as shown in the diagram below. Scalene $\triangle BFC$ is formed.

Which statement will allow Steve to prove $ABCD \parallel EFG$?

1. $\angle CFG \cong \angle FCB$
2. $\angle ABF \cong \angle BFC$
3. $\angle EFB \cong \angle CFB$
4. $\angle CBF \cong \angle GFC$

(14) In the diagram below, $EF$ intersects $AB$ and $CD$ at $G$ and $H$, respectively, and $GI$ is drawn such that $GH \cong IH$.

(15) If $m\angle EGB = 50^\circ$ and $m\angle DIG = 115^\circ$, explain why $AB \parallel CD$.

Prove the sum of the exterior angles of a triangle is $360^\circ$. 
(1) The LO (Learning Outcomes) are written below your name on the front of this packet. Demonstrate your achievement of these outcomes by doing the following:

Use the diagram below to complete each part.

(a) Identify the reference angle ______________

(b) Identify each side
   Opposite ____________
   Hypotenuse ____________
   Adjacent ____________

(c) Complete each ratio with names of sides. Is this the sine, cosine or tangent ratio? (circle one)

\[
\frac{\text{opposite}}{\text{hypotenuse}} \quad \text{______________} \quad \text{sine \hspace{1em} cosine \hspace{1em} tangent}
\]

\[
\frac{\text{adjacent}}{\text{hypotenuse}} \quad \text{______________} \quad \text{sine \hspace{1em} cosine \hspace{1em} tangent}
\]

\[
\frac{\text{opposite}}{\text{adjacent}} \quad \text{______________} \quad \text{sine \hspace{1em} cosine \hspace{1em} tangent}
\]

(d) Can a triangle ABC exist that has the same tangent, sine, and cosine ratios as triangle DQE, but is not congruent to triangle DQE? Explain. You may also make a sketch or draw on the diagram at the top of the page to help you answer this question.
Write each expression in simplest form

(1) $\sqrt{270}$  
(2) $\sqrt{6} \cdot \sqrt{18}$  
(3) $5\sqrt{7} - 2\sqrt{14}$