Developing Conceptual Understanding of Number

Set D: Geometry

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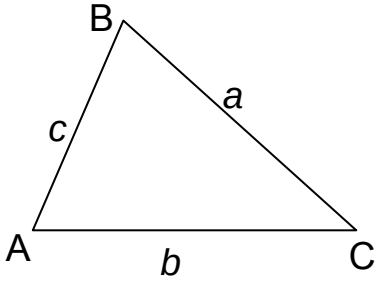
Geometry 1

Vocabulary

- side
- triangle
- angle
- shortest side
- opposite side

Notes

- Note that in a triangle, the shortest side is always opposite the smallest angle and vice versa. Similarly, the longest side is opposite the largest angle and vice versa.
- The sum of the angles of a triangle is 180°.
- There are three ways to name the sides of a triangle. For example, a, CB and BC are all naming the same side.



- There are three ways to name an angle. For example, ∠BAC, ∠CAB, ∠A all name the same angle.

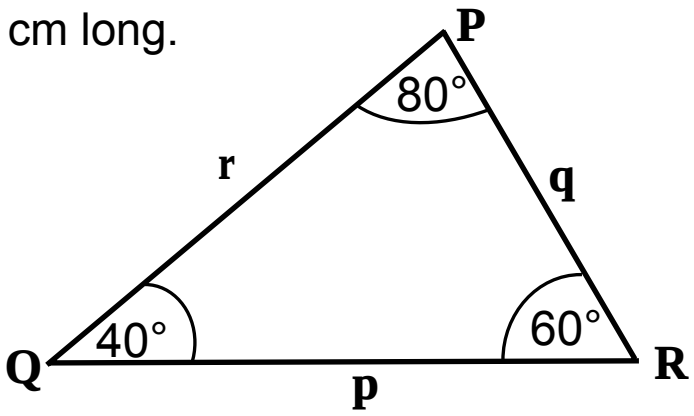
Answers

1. a) QP or r
   b) PR or RP or q
   c) 40°
   d) QR or RQ or p
   e) Possible Answers:
      - It is the largest angle.
      - It is 80°.
      - …
   f) 180°

2. a) ED or f
   b) 40°
   c) DE or ED or f
   d) d, e, f or EF, DF, DE or …
   e) ∠DFE or ∠EFD

Geometry 1

1. In ∆PQR side PQ is 6.8 cm long, side PR is 5.0 cm long, and side QR is 7.8 cm long.



a) Name side PQ of the triangle another way.
b) What is the shortest side of ∆PQR?
c) What is the size of the angle opposite the shortest side?

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d) What is the longest side of ∆PQR?
e) What can you say about the angle opposite the longest side?

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f) What is the sum of the 3 angles in ∆PQR?

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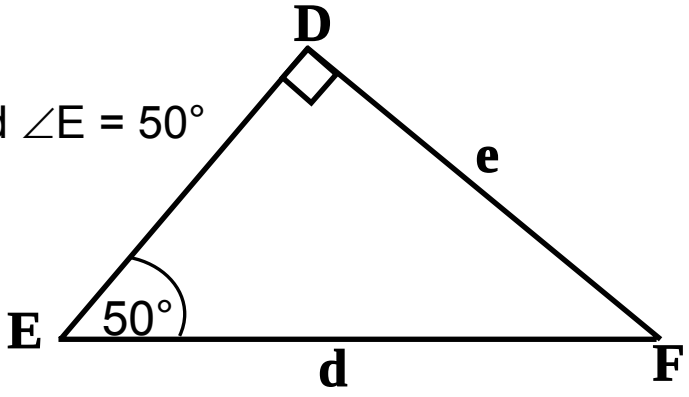
2. Consider ∆DEF with ∠D=90° and ∠E = 50°



a) Name side DE another way.
b) What is the size of ∠F?

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c) What is the shortest side of ∆DEF?
d) Arrange the side lengths for ∆DEF in descending order.
e) Name angle F another way.

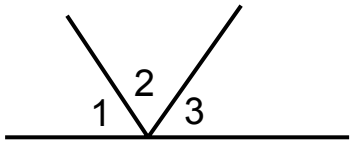
Geometry 2

Vocabulary

- sum
- mathematical term
- angle measure
- sketch
- protractor

Notes

- All angles that form a straight angle have a sum of 180°.



$\angle 1 + \angle 2 + \angle 3 = 180°$

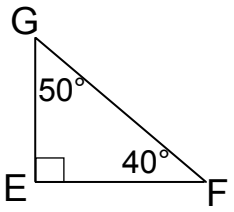
- For #3, a sketch does not require accurate measurements but should be correctly labelled. The sketch in this question should have one angle that is approximately 90°.

Answers

1. a) 180°
   b) 30°
   c) RS or SR or t
   d) Supplementary
   e) $\angle$UTR or $\angle$RTU

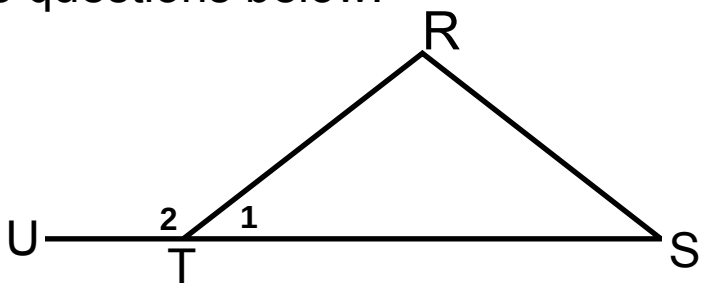
2. $\angle 3$

3.



Geometry 2

1. Use ΔRST to answer the questions below:



a) What is the sum of $\angle 1$ and $\angle 2$?

b) If $\angle R = 80°$ and $\angle S = 70°$, find the size of $\angle 1$.

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c) Name the side of ΔRST that is opposite $\angle 1$. Give your answer in two different ways.

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d) What is the mathematical term for angles with a sum of 180°?

e) Name $\angle 2$ in two different ways.

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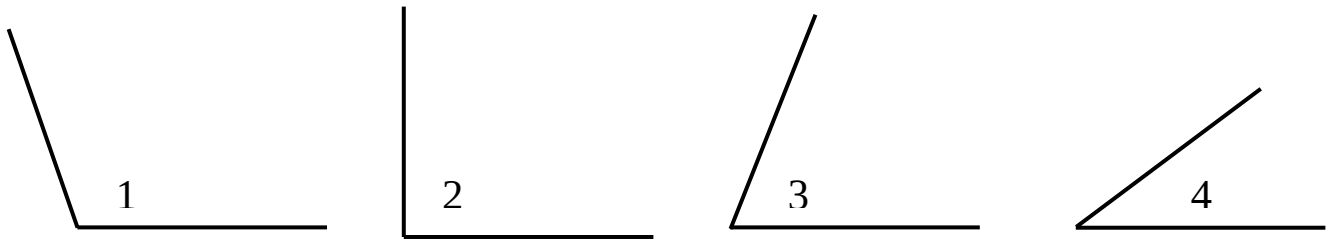
2. Which angle has a measure of about 75°?



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3. Sketch ΔEFG with $\angle E = 90°$ and $\angle F = 40°$. Do not use a protractor. Label your sketch.

Geometry 3

Vocabulary

- complementary angles
- supplementary angles

Notes

- For #2, as a kinesthetic activity, students could work together to form complementary or supplementary angles with their arms.

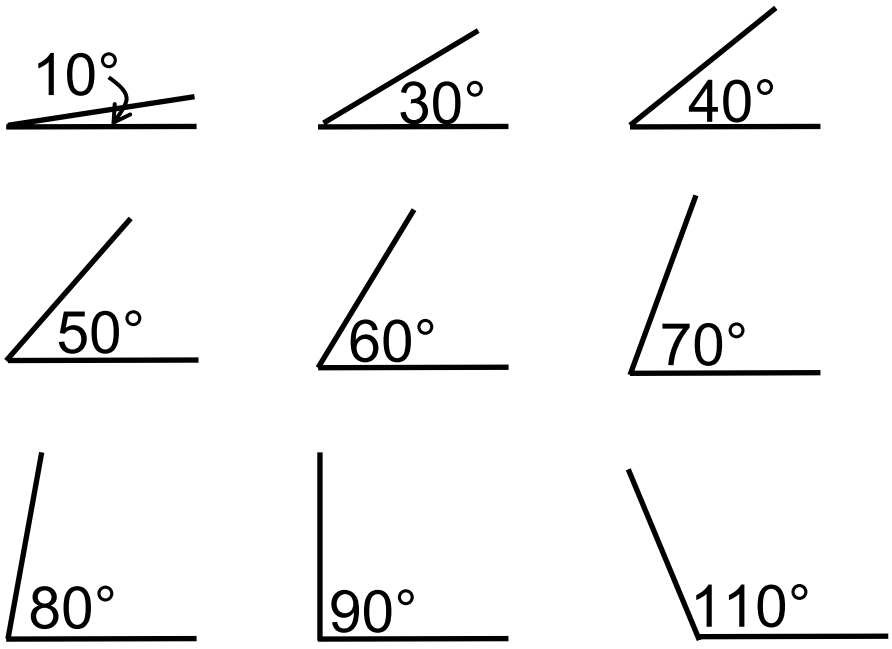
Answers

1. Possible answers:
   - As long as the three angles add to 180°, a triangle can be formed.
   - 10°, 60°, 110°
     50°, 40°, 90°
     30°, 70°, 80°
   - 10°, 80°, 90°
     30°, 40°, 110°
     50°, 60°, 70°
   - …

2. Possible answers:
   - Complementary angles add to 90° while supplementary angles add to 180°. For example, 30° and 60° are complementary while 30° and 150° are supplementary.
   - …

Geometry 3

1. Use the following angles to make 3 triangles. Use each angle only once. Label each triangle. Explain how you know that you can make a triangle with each of your sets of 3 angles.



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2. Use examples to show the difference between complementary angles and supplementary angles.

Geometry 4

Vocabulary

- isosceles triangle

Notes

- For #3, similar questions were introduced in Set C.

Answers

1. a) 40°
   b) YZ or ZY or x

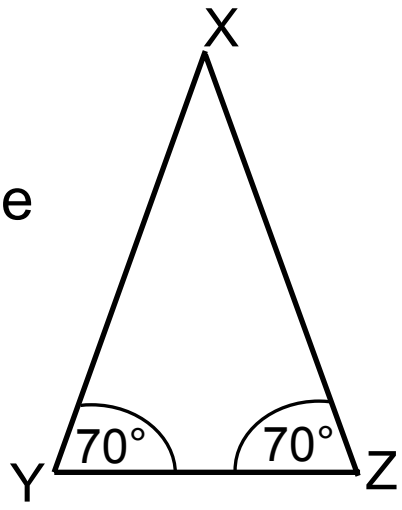
2. a) 30°
   b) 150°
   c) MO or *n*
   d) $\angle$ONM or $\angle$MNO

3. a) 50%, $\frac{1}{2}$, 0.5

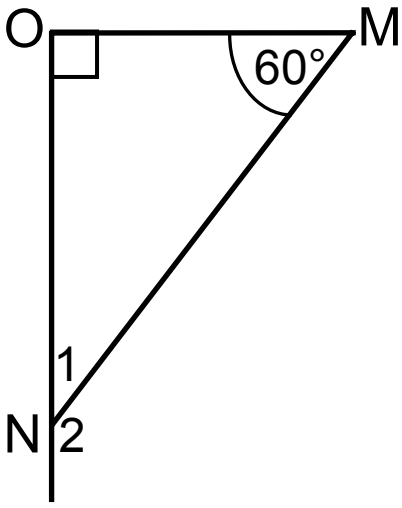
   b) 75%, $\frac{75}{100}$ or $\frac{3}{4}$, 0.75

Geometry 4

1. A triangle with two equal angles is isosceles. ΔXYZ is isosceles with the angles shown.
   a) What is the size of $\angle X$?
   b) What is the shortest side of ΔXYZ?

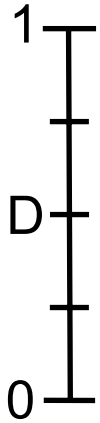


2. Use the diagram to help answer the following questions:
   a) Find the size of $\angle I$.
   b) Find the size of $\angle 2$.
   c) Name OM another way.
   d) Name $\angle 1$ another way.

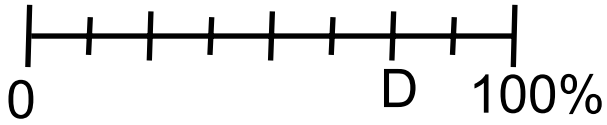


3. For each diagram, find values for D. Give a percent, an equivalent fraction, and a decimal value for each.

a)



b)



Geometry 5

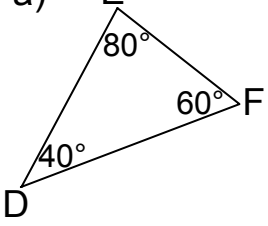
Vocabulary

Notes

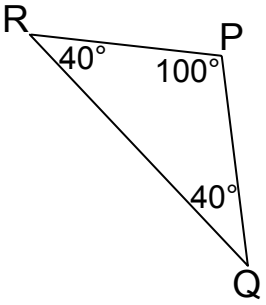
Answers

1. a) 70°
   b) 125°
   c) YZ or ZY or *x*

2. a)

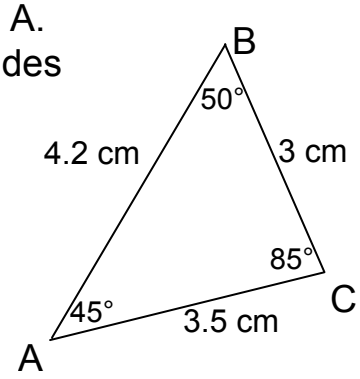


b)



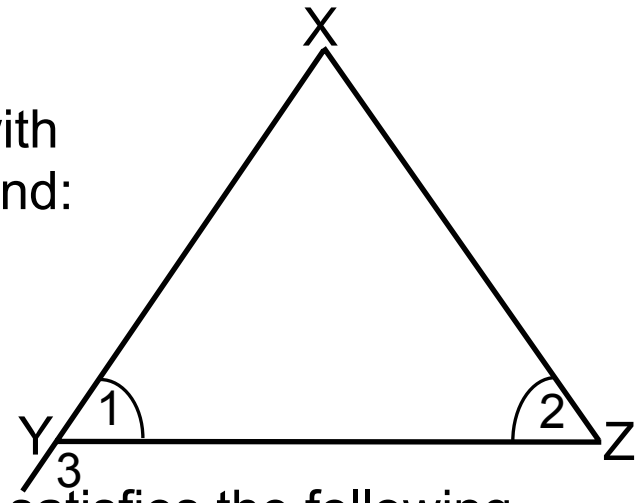
3. a) 180°
   b) 50°

4. Possible Answers:
   - The shortest side of a triangle is always opposite the smallest angle. For example, in ∆ABC below, side BC is the shortest side and is opposite angle A.
   - Measure the sides
   - …



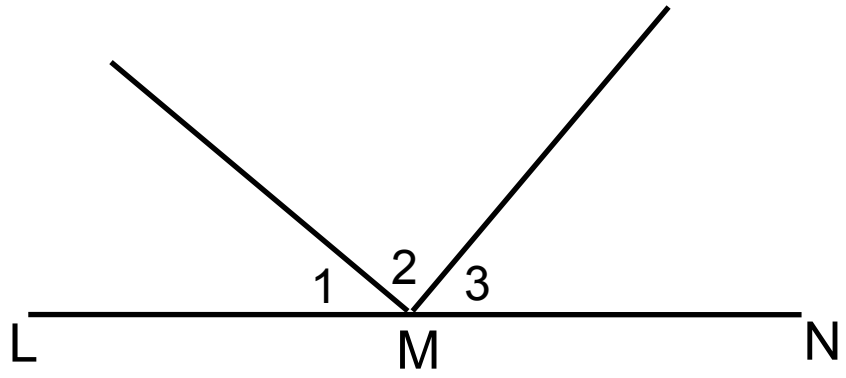
Geometry 5

1. ΔXYZ is an isosceles triangle with equal angles 1 and 2 shown. Find:
   a) the size of $\angle X$ if $\angle 2 = 55°$.
   b) the size of $\angle 3$.
   c) the longest side of ΔXYZ.



2. Sketch and label a triangle that satisfies the following conditions:
   a) ΔDEF with $\angle D = 40°$ and $\angle F = 60°$
   b) isosceles ΔPQR with $\angle P = 100°$

3. Consider the straight line LMN with 3 angles shown at M.
   a) What is the sum of $\angle$'s 1, 2, and 3?
   b) If $\angle 1 = 40°$ and $\angle 2 = 90°$, what is the size of $\angle 3$?



4. Describe how you can tell which is the shortest side of a triangle. Use an example.

Geometry 6

Vocabulary

- difference

Notes

- For #3, students should not go to the smallest interval because it is not necessary to know the smallest interval is 12.5%. Students should realize that E is halfway between 75% and 100%.

Answers

1. a) 70°
   b) ST or TS or r.

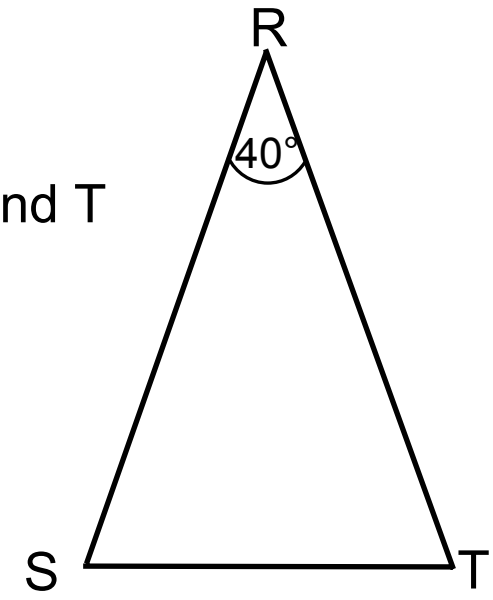
2. a) 140°
   b) No, ΔMNO is not isosceles since there are not two angles equal. There is a 90°, a 50° and a 40° angle.
   c) $\angle 1$ and $\angle 2$

3. a) D: 25%, $\frac{25}{100}$ or $\frac{1}{4}$, 0.25
   E: 87.5% ; $\frac{87.5}{100}$ or $\frac{7}{8}$, 0.875

   b) $\frac{5}{8}$
   Possible Answers:
   - There are 8 spaces in total, and there are 5 spaces between D and E.
   - $\frac{7}{8} - \frac{2}{8} = \frac{5}{8}$
   - …

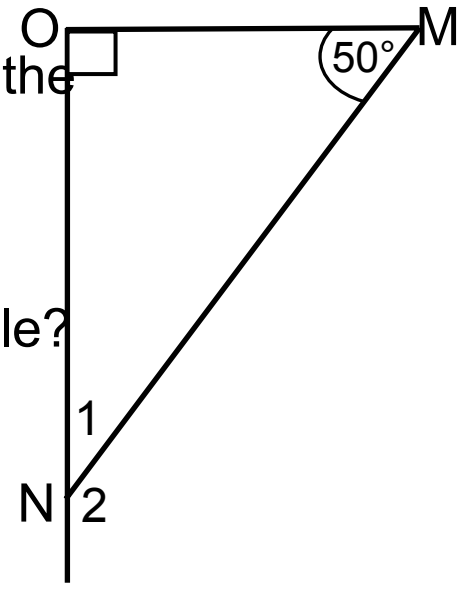
Geometry 6

1. ΔRST is isosceles with angles S and T equal. $\angle R = 40°$.
   a) What is the size of $\angle S$?
   b) What is the shortest side of ΔRST?

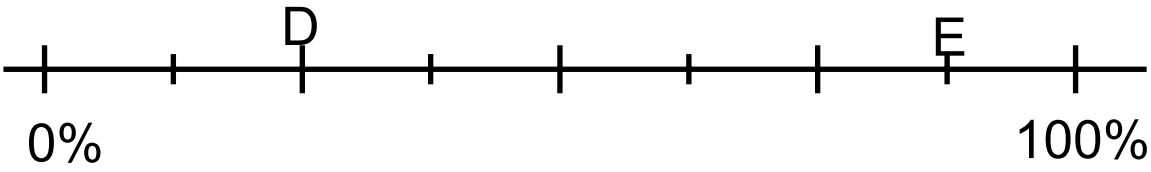


2. Use the diagram to help answer the following questions:

   a) Find the size of $\angle 2$.
   b) Is ΔMNO an isosceles triangle? Why?
   c) Name 2 angles that are supplementary.



3.



   a) Give percent, fraction, and decimal values for D and E shown in the diagram.
   b) What is the difference between D and E expressed as a fraction? Show how to find the difference 2 ways.

Geometry 7

Vocabulary

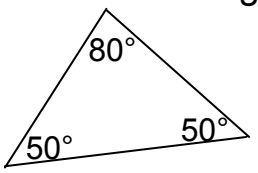
- complement

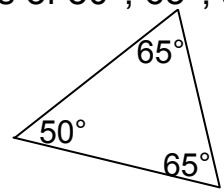
Notes

Answers

1. a) 62°
   b) 118°
   c) Sides XY and XZ are equal in length. (or YX, z or ZX, y)

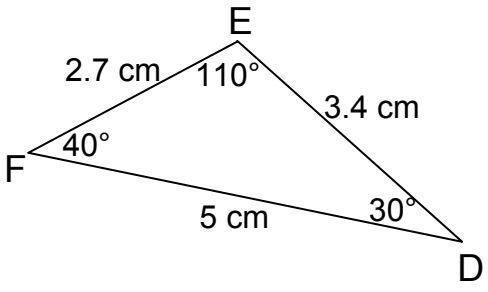
2. There are two possible triangles – one with angle sizes of 50°, 50°, and 80° and the other with angle sizes of 50°, 65°, and 65°.





3. a) 180°
   b) 45°

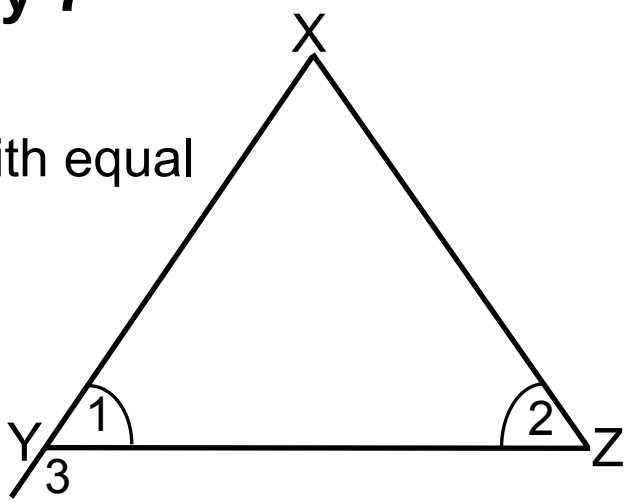
4. Possible Answers:
   - The longest side of a triangle is always opposite the largest angle. For example, in ∆DEF, the longest side is DF and it is opposite the largest angle, E.



   - You could measure the sides.
   - …

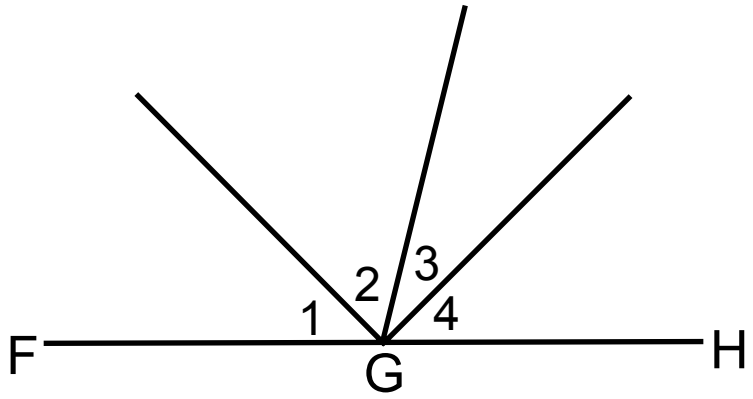
Geometry 7

1. ΔXYZ is an isosceles triangle with equal angles 1 and 2 shown. Find:
   d) the size of $\angle 2$ if $\angle X = 56°$.
   e) the size of $\angle 3$.
   f) the longest side of ΔXYZ.



2. Sketch all possible isosceles triangles ABC with $\angle B = 50°$. Label your triangles.

3. Consider the straight line FGH with 4 angles shown at G.
   c) What is the sum of $\angle$'s 1, 2, 3, and 4?
   d) If $\angle 1 = \angle 4$ and $\angle 2$ is the complement of $\angle 3$, what is the size of $\angle 4$?



4. Describe how you can tell which is the longest side of a triangle. Use an example.