UNIVERSITY OF WATERLOO

Faculty of Mathematics
Waterloo, Ontario N2L 3G1

Centre for Education in
Mathematics and Computing

Grade 7/8 Math Circles

Wednesday, March 31, 2021

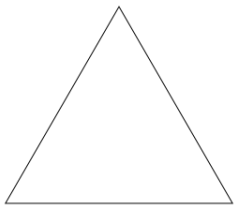
Triangles - Problem Set

1. Draw an example of the triangle described.

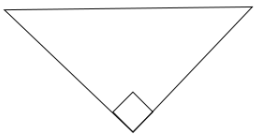
   (a) equilateral (b) scalene (c) obtuse right (d) isosceles acute

2. Why are all equilateral triangles classified as acute triangles? Explain using a diagram and properties of triangles.

3. Identify the hypotenuse of the following triangles by labeling the side with an h, if there is one.



(a)



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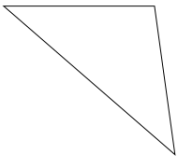
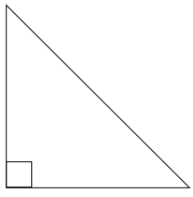


(b)

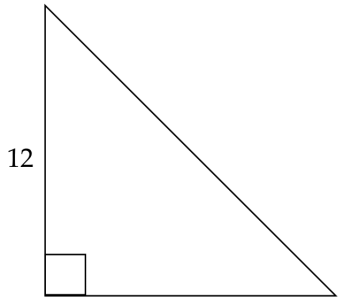


(d)

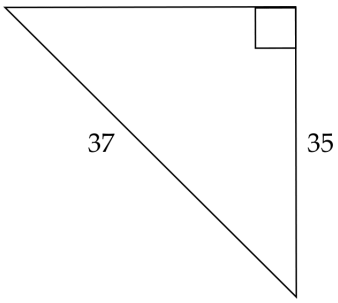
4. Rearrange the Pythagorean Theorem to come up with an equation for each variable. The first one is done for you.

   (a) $c = \sqrt{a^2 + b^2}$ (b) $a =$ (c) $b =$

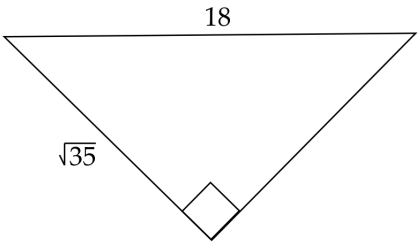
5. Use the Pythagorean Theorem to solve for the missing side.



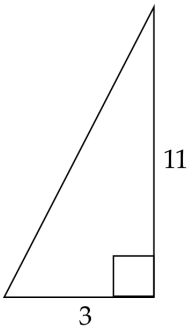
(a)



(b)



(c)



(d)

6. Consider the following values for a, b, and c, such that, a, b are the lengths of the legs of a right triangle (in cm) and c is the length of the hypotenuse (in cm). Solve for the missing length. Where applicable, leave your answer in radical form and simplify the radical.

   (a) $a = 8$, $b = 15$, $c = ?$

   (b) $a = 20$, $b = ?$, $c = 29$

   (c) $a = ?$, $b = 6$, $2\sqrt{19}$

   (d) $a = 9$, $b = \sqrt{31}$, $c = ?$

   (e) $a = 2$, $b = 4$, $c = ?$

   (f) $a = ?$, $b = \dfrac{\sqrt{3}}{2}$, $c = 1$

7. Ximena lives 5 km due north of the University of Waterloo. Ty lives 13 km due west of the University. How far apart do they live from each other?

8. Maya is in a helicopter 165 m above the ground. The launching pad is 30 m away from where the helicopter is hovering. What is the distance between Maya's helicopter and the launching pad?

9. A slide is 7 m long from the top of the slide to the ground and goes across 5 m. If Sandy is standing at the top of the slide, how many meters above the ground is she?

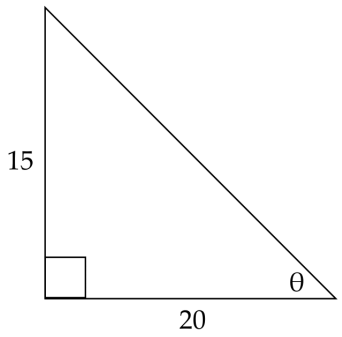
10. Compute the following trig ratios. Round to two decimal points.

(a) $\sin(39°)$ (c) $\cos(40°)$ (e) $\sin(57°)$

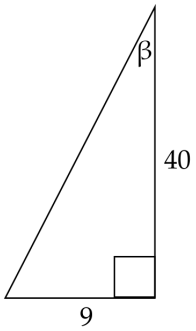
(b) $\tan(25°)$ (d) $\tan(16°)$ (f) $\cos(8°)$

11. Find all three primary trig ratios for the given triangles.

(a)



(d)



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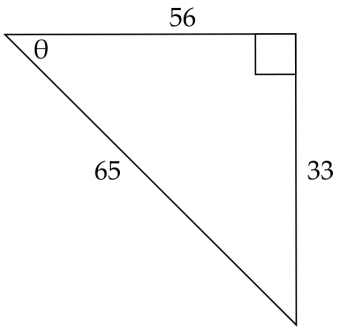
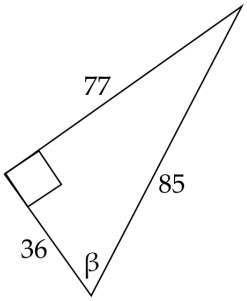
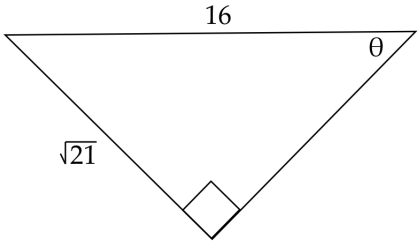


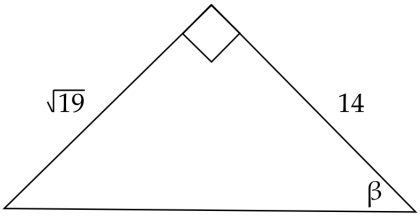
(e)



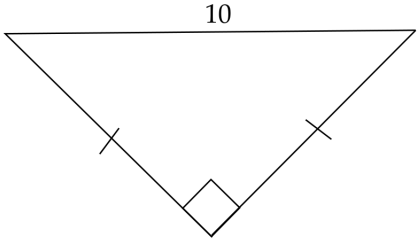
(c)



(f)



12. Jackie drew the triangle below. Find all the sides of the triangle and the primary trigonometric ratios.



13. Elmdale Public School is building an accessibility ramp at the front of the school. To meet safety guidelines, the ramp must have an incline no more than $35°$.

    (a) In the current design, the ramp is 24 feet long and 10 feet wide. Does the ramp satisfy the safety conditions? Explain.

    (b) Pablo is submitting a design for the ramp. In his design, the ramp has an incline of $30°$. If the length of the ramp is 15 feet, how tall is the ramp? (*Hint:* $\sin(30°) = \frac{1}{2}$)

14. A square has a diagonal of $4\sqrt{2}$ cm.

    (a) What is the side length of the square?

    (b) What is the perimeter and area?