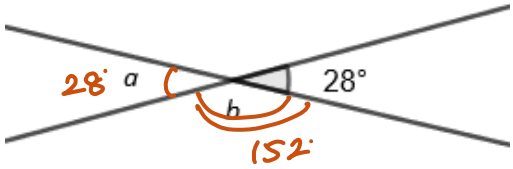
Practice Test- Angle Theorems, Similar Triangle and Right-Angled Trigonometry

1. Determine the unknown angles. State the reasons behind your answers.

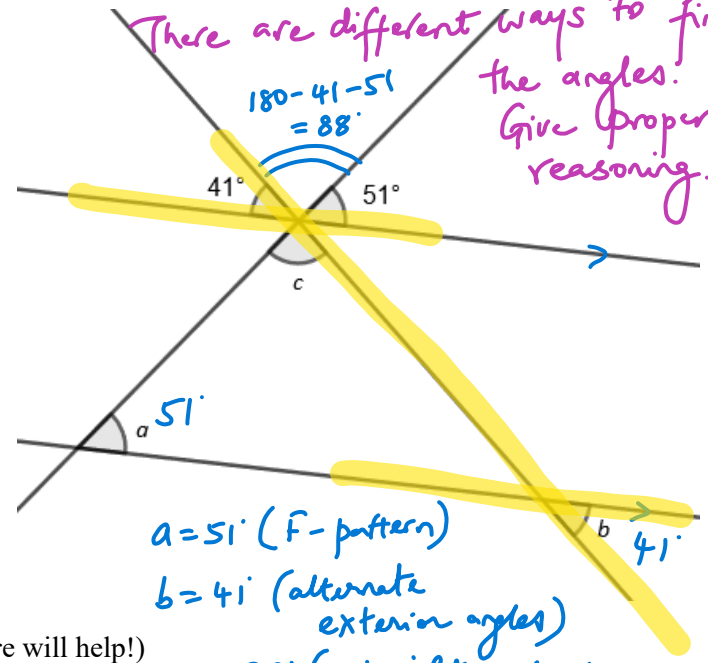
PLEASE NOTE:
There are different ways to find the angles. Give proper reasoning.

a)



$a = 28°$ (vertically opposite angles)

$b = 180 - 28 = 152°$ (straight angle)

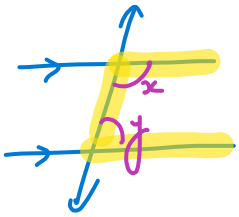


$a = 51°$ (F-pattern)

$b = 41°$ (alternate exterior angles)

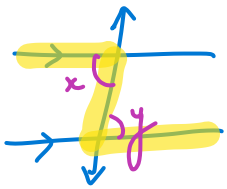
$c = 88°$ (straight angle + vertically opposite angles)

2. i. Describe the "C-pattern" for angle theorems (a picture will help!)



$x + y = 180°$

ii. Describe the "Z-pattern" for angle theorems (a picture will help!)

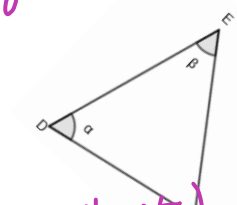


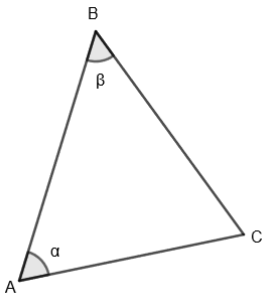
$x = y$

3. a. Are the given two triangles similar? Justify using statement reason format.

b. What do you know about the corresponding sides and angles of similar triangles?

a) In the given two diagrams of triangles, we see that $\angle D = \angle A = \alpha$ and $\angle E = \angle B = \beta$





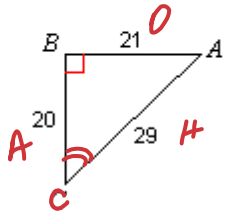
$\therefore \triangle DEF \sim \triangle ABC$ (AA Similarity)

b) Corresponding angles are EQUAL. i.e. $\angle D = \angle A$; $\angle E = \angle B$; $\angle F = \angle C$

Corresponding sides are PROPORTIONAL i.e. $\frac{DE}{AB} = \frac{EF}{BC} = \frac{DF}{AC}$

Find the value of each trigonometric ratio.

4) cos C



O

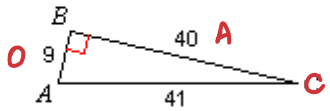
A

H

CAH

$\cos C = \frac{20}{29}$

5) tan C



O

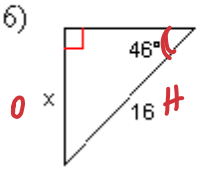
H

TOA

$\tan C = \frac{9}{40}$

Find the missing side. Round to the nearest tenth.

6)



O

H

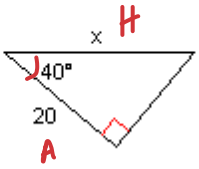
SOH

$\sin 46 = \frac{x}{16}$

$16 \sin 46 = x$

$x = 11.5$ (approx)

7)



H

A

CAH

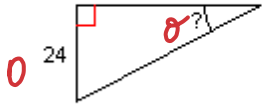
$\cos 40 = \frac{20}{x}$

$x = \frac{20}{\cos 40}$

$x = 26.1$ (approx)

Find the measure of the indicated angle to the nearest degree.

8)



A

O

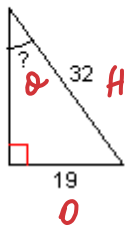
TOA

$\tan \theta = \frac{24}{46}$

$\theta = \tan^{-1}\left(\frac{24}{46}\right)$

$\theta = 28°$ (approx)

9)



H

O

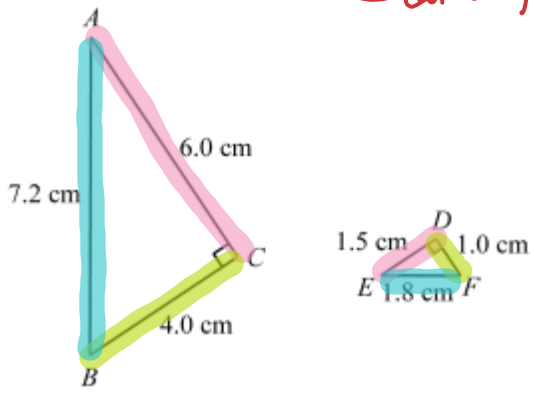
SOH

$\sin \theta = \frac{19}{32}$

$\theta = \sin^{-1}\left(\frac{19}{32}\right)$

$\theta = 36°$ (approx)

10. Prove that ΔABC~ΔEFD. Remember the use of proper statement and reason for your proof.



↖ can be proved using ~SAS or ~SSS

Method 1

$\frac{AC}{DE} = \frac{6}{1.5} = 4$ S

$\frac{BC}{DF} = \frac{4}{1} = 4$ S

$\frac{AB}{EF} = \frac{7.2}{1.8} = 4$ S

$\therefore \Delta ABC \sim \Delta EFD$ (SSS~)

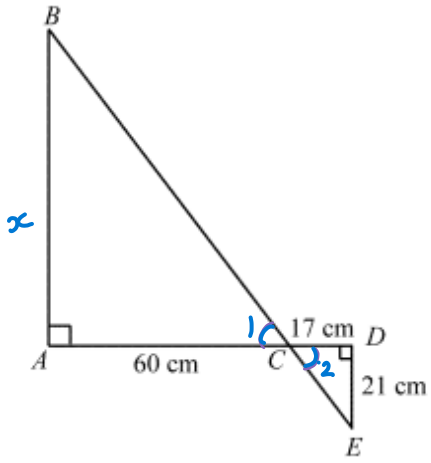
Method 2

$\frac{AC}{DE} = \frac{BC}{DF} = 4$ S A S

$\angle C = \angle D = 90^\circ$

$\therefore \Delta ABC \sim \Delta EFD$ (SAS~)

11. Determine the length of AB. Justify how you arrived at the solution with proper reasoning.



STATEMENT	REASON
$\angle 1 = \angle 2$	opposite angles
$\angle A = \angle D$	$= 90^\circ$
$\therefore \Delta ABC \sim \Delta DEC$	(AA~)
$\therefore \frac{AB}{DE} = \frac{AC}{DC}$	(proportional sides of ~Δs.)

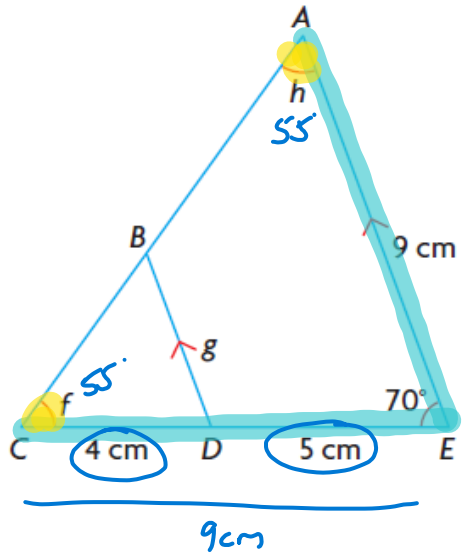
$\Rightarrow \frac{x}{21} = \frac{60}{17}$

$\Rightarrow x = \frac{60}{17} \times 21$

$\Rightarrow x = 74.1$

$\therefore$ length of AB = 74.1 cm.

12. Determine *f*, *g*, and *h* **(hint: Find *g* first and what type of triangle is this?)**



9cm

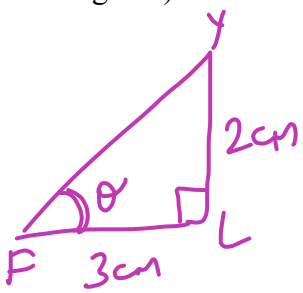
STATEMENT	REASON
$f = h$	ΔACE is isosceles
$f + h + 70 = 180^\circ$	Angle Sum prop. of Δs.
$\therefore f = h = \frac{180-70}{2} = \frac{110}{2} = 55^\circ$	
$\angle C = \angle C$	Common angle
$\angle D = \angle E = 70^\circ$	(F-pattern)

$\therefore \Delta CDB \sim \Delta CEA$ (AA~)

$\therefore \frac{CD}{CE} = \frac{BD}{AE}$

$\Rightarrow \frac{4}{9} = \frac{g}{9} \Rightarrow g = 4$ cm

13. A frog is hungry. He sees a fly and starts the calculations. He realizes that the fly is 3cm directly in front of him and 2 cm above him. What angle of elevation must his tongue leave his mouth to catch the fly? (assuming that the fly doesn't move while he pulls out his calculator and works out the angle....)



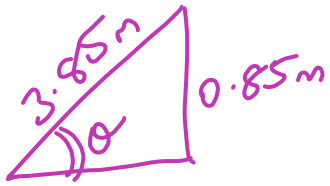
TOA

$\tan\theta = \frac{2}{3}$

$\theta = \tan^{-1}\left(\frac{2}{3}\right) = 34^\circ \text{ (approx)}$

Ans. statement.

14. A tow truck raises the front end of a car 0.85m above the ground. The car is 3.85m long. What angle does the car make with the ground?



SOH

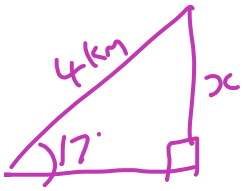
$\sin\theta = \frac{0.85}{3.85}$

$\theta = \sin^{-1}\left(\frac{0.85}{3.85}\right)$

$\theta = 13^\circ \text{ (approx)}$

Ans. statement

15. A mountain road rises with a constant 17° incline. Calculate the increase in altitude of a cyclist who rides 4 km up the road.



SOH

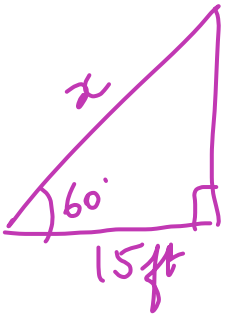
$\sin 17 = \frac{x}{4}$

$4\sin 17 = x$

$x = 1.17 \text{ km (approx)}$

Ans. statement

16. A damsel is in distress and is being held captive in a tower. Her knight in shining armor is on the ground below with a ladder. When the knight stands 15 feet from the base of the tower and looks up at his precious damsel, the angle of elevation to her window is 60 degrees. How long does the ladder have to be? Draw a picture. x



CAH

$\cos 60 = \frac{15}{x}$

$x = \frac{15}{\cos 60}$

$x = 30 \text{ ft.}$

Ans. statement