More word problems

1. A bridge uses triangular metal supports. Each support forms triangle ABC where $AB = 8$ ft, $BC = 6$ ft, and $AC = 10$ ft.
Another support forms triangle DEF with sides $DE = 8$ ft, $EF = 6$ ft, and $DF = 10$ ft.

Explain why the triangles are congruent and determine the measure of $\angle E$ if $\angle B = 45°$.

2. Two triangular garden sections are built in a park. Triangle ABC has sides 12 m, 9 m, and 15 m. Triangle DEFhas the same three side lengths.

If angle A measures $50°$, what is the measure of angle D?

3. Two roof trusses form triangles ABC and DEF.
$AB = DE = 10$ ft, $BC = EF = 14$ ft, and the included angles $\angle B$ and $\angle E$ are each $60°$.

If side $AC = 16$ ft, what is the length of side DF?

4. A surveyor marks triangle ABC with $AB = 20$ m and $AC = 18$ m. The included angle at A is $40°$.
Another triangle DEF has $DE = 20$ m, $DF = 18$ m, and $\angle D = 40°$.

If angle $C = 65°$, find angle F.

5. Two triangular frames are made for banners. Each frame has sides 7 in, 9 in, and 11 in.

If angle opposite the 11-inch side in the first frame is $100°$, what is the corresponding angle in the second frame?

6. Two triangular windows are built with:

- base = 6 ft
- one side = 10 ft
- included angle = $30°$

If the third side of the first window measures 8 ft, what is the third side of the second window?

7. A trellis has two triangular sections ABC and DEF.

$$\angle A = \angle D = 50°$$
$$\angle B = \angle E = 60°$$

$AB = DE = 12$ ft

If side $BC = 10$ ft, find side EF.

8. Two mountain slopes form triangles ABC and DEF.
$AB = DE = 5$ km
$BC = EF = 7$ km
$AC = DF = 8$ km

If angle $B = 72°$, what is angle E?

9. Two triangular cable supports are installed with sides 6 m, 8 m, and 10 m.

If one triangle has angle opposite the 10 m side equal to $90°$, what is the same angle in the other triangle?

10. A designer creates two triangular tiles.
Each tile has angles $40°$, $60°$, and $80°$.
The side between the $40°$ and $60°$ angles measures 5 cm.

If the side opposite the $80°$ angle on the first tile is 6 cm, what is that side on the second tile?

11. Triangles ABC and DEF represent two street intersections.
$AB = DE = 100$ ft

$$\angle A = \angle D = 55°$$
$$\angle B = \angle E = 65°$$

If $BC = 120$ ft, find EF.

12. Two triangular frames supporting a dock have sides 9 ft, 12 ft, and 15 ft.

If one triangle has a $90°$ angle between the 9-ft and 12-ft sides, what is the corresponding angle in the other triangle?

13. Two triangular brackets support satellite dishes.

Triangle ABC:
$AB = 14$ in
$AC = 10$ in

$$\angle A = 45°$$

Triangle DEF:
$DE = 14$ in
$DF = 10$ in

$$\angle D = 45°$$

If side $BC = 12$ in, find side EF.

14. Two triangular flag supports have angles:
$50°$, $60°$, and $70°$.

If the side between the $50°$ and $60°$ angles is 8 ft in one triangle, and the corresponding side in the second triangle is also 8 ft, find the length of the side opposite the $70°$ angle if it is 9 ft in the first triangle.

15. Two braces in a building form triangles with:

- $AB = 4$ m
- $BC = 5$ m
- $AC = 7$ m

If angle $C = 45°$, what is angle F in the second congruent triangle?

16. Triangle ABC has:
$AB = 30$ m
$BC = 40$ m
$AC = 50$ m

Triangle DEF has the same side lengths.

If $\angle A = 37°$, find $\angle D$.

17. Two triangular fence panels have:

- $\angle A = \angle D = 35°$
- $\angle B = \angle E = 75°$
- $AB = DE = 6$ ft

If side $BC = 8$ ft, what is side EF?

18. Two anchor cables form right triangles.

Triangle ABC:
$AB = 9$ ft
$BC = 12$ ft
Right angle at B

Triangle DEF:
$DE = 9$ ft
$EF = 12$ ft
Right angle at E

If $AC = 15$ ft, find DF.

19. Two triangular paths have:

- $AB = DE = 10$ m
- $BC = EF = 13$ m
- included angle $= 50°$

If $AC = 15$ m, find DF.

20. Two triangular frames holding solar panels have:

- $AB = DE = 16$ ft
- $\angle A = \angle D = 40°$
- $\angle B = \angle E = 70°$

If side $BC = 18$ ft, find side EF.

Extra problems

1. A carpenter is repairing a triangular roof truss. One side of the truss measures 10 ft, another measures 12 ft, and the angle between them is $60°$.
A replacement truss is built with the same two sides and included angle.

If the third side of the original truss measures **14 ft**, what must the third side of the replacement truss measure?

2. A surveyor wants to find the distance across a lake from point A to point B.
She measures triangle ABC on land where $AC = 40$ m, $BC = 50$ m, and $AB = 60$ m.

She creates another triangle DEF with the same three side lengths.

If the unknown distance across the lake corresponds to side DF, what is that distance?

3. Two triangular steel supports hold up a bridge section.

The original support has sides:
8 ft, 15 ft, and 17 ft.

A replacement support is built with the same three side lengths.

If the angle opposite the 17-ft side in the original is $90°$, what is the corresponding angle in the replacement?

4. Two cable supports form triangles with sides 9 m and 12 m with a right angle between them.

If the distance between the ends of the cables in the first support is **15 m**, what must the distance be in the second support?

5. A triangular flower bed has sides 7 m, 9 m, and 11 m.

A landscaper creates another bed with the same three side lengths on the opposite side of the garden.

If the angle opposite the 11-m side in the first bed is $100°$, what is the same angle in the second bed

6. A surveyor forms triangle ABC on one side of a canyon with:

$AB = 70$ m
$AC = 50$ m

$$\angle A = 40°$$

He constructs triangle DEF with the same measurements.

If side $BC = 60$ m, what is the distance across the canyon represented by EF?

7. Two triangular braces are used to stabilize a deck.

Each brace has:
one side = 6 ft
another side = 8 ft
included angle = 90°

If the third side of one brace measures **10 ft**, what is the third side of the other brace?

8. Two anchor cables form triangular supports with sides 10 m, 24 m, and 26 m.

If the angle opposite the 26-m cable in the first triangle is 90°, what is the same angle in the second triangle?

9. Two triangular window frames are built with angles 40°, 60°, and 80°.

The side between the 40° and 60° angles is 6 ft in both windows.

If the side opposite the 80° angle in the first window is **8 ft**, what is it in the second window?

10. A surveyor measures triangle ABC:

$AB = 100$ m
$BC = 120$ m
$AC = 140$ m

Another triangle DEF is constructed with the same three side lengths.

If angle $A = 45°$, what is angle D?

11. Two triangular frames support a playground climbing structure.

Each frame has sides 5 ft, 12 ft, and 13 ft.

If the angle opposite the 13-ft side in the first frame is $90°$, what is it in the second frame?

12. A surveyor cannot cross a river directly.

He measures triangle ABC:

$AB = 30$ m
$AC = 40$ m $\quad \angle A = 90°$

A second triangle DEF is constructed with the same measurements.

If $BC = 50$ m, what is the width of the river represented by EF?

13. Two triangular frames hold solar panels.

Each has:
$AB = 14$ ft
$AC = 10$ ft

$$\angle A = 50°$$

If side BC of the first frame measures **12 ft**, what must side EF measure?

14. A triangular support for a fence has angles $35°$, $75°$, and $70°$.

The side between the $35°$ and $75°$ angles measures 6 ft. A second support is built with the same measurements.

If the side opposite the $70°$ angle in the first support is **7 ft**, what is it in the second?

15. Two triangular ramp braces are constructed with:

8 ft and 15 ft sides
included angle $= 90°$

If the third side in the first brace measures **17 ft**, what must the third side of the second brace measure?

16. A surveyor marks triangle ABC:

$AB = 60$ m
$BC = 80$ m
$AC = 100$ m

Another triangle DEF is created with the same side lengths.

If $\angle B = 90°$, what is $\angle E$?

17. Two triangular metal plates are cut with:

sides 9 in, 10 in, and 17 in.

If the angle opposite the 17-in side in the first plate is $120°$, what is it in the second plate?

18. Two triangular bridge braces have:

$AB = 16$ ft
$BC = 20$ ft
included angle $= 60°$

If $AC = 24$ ft in one brace, what is DF in the other?

19. Triangle ABC has: $\angle A = 50°$ $\angle B = 60°$
side $AB = 20$ m

Triangle DEF has the same angles and side.

If $BC = 18$ m, what is EF?

20. Two triangular trellises are built with:

$AB = 12$ ft
$AC = 16$ ft
$\angle A = 40°$

If the third side in the first trellis measures **18 ft**, what must the third side measure in the second trellis?