**Cosine Law**

Situation #1 – SAS (Side, Angle, Side) Situation #2 – SSS (all sides are given)

12

18

x

60°

17

12

24

x

**Law of Cosines**

A

C

B

b

a

c

To determine a missing side, we use one of the following formulas:

c2 = a2 + b2 - 2ab(**cos**C)
a2 = b2 + c2 - 2bc(**cos**A)
b2 = a2 + c2 - 2ac(**cos**B)

To determine a missing angle, we use one of the following formulas:

**Example #1**

12

18

x

60°

**Step #1 – Identify which situation you have, SAS or SSS**

SAS

**Step #2 – Label your sides and angles (As long as sides and angles are opposite each other, it doesn’t matter where the letters go)**

A

12

18

x

60°

c

b

a

C

B

**Step #3 – Pick the appropriate formula based on the angle that you have**

Angle C is given, therefore...

c2 = a2 + b2 - 2ab(**cos**C)

**Step #4 – Solve**

c2 = a2 + b2 - 2ab(**cos**C)

c2 = 182 + 122 - 2(18)(12)(**cos**60)

c2 = 324 + 144 – 216

c2 = 252

c = = 15.87

**Example #2**

77

52

x

40°

**Step #1 – Identify which situation you have, SAS or SSS**

SAS

**Step #2 – Label your sides and angles (As long as sides and angles are opposite each other, it doesn’t matter where the letters go)**

77

52

x

40°

A

B

C

a

c

b

**Step #3 – Pick the appropriate formula based on the angle that you have**

Angle A is given, therefore...

a2 = b2 + c2 - 2bc(**cos**A)

**Step #4 – Solve**

a2 = b2 + c2 - 2bc(**cos**A)

a2 = 522 + 772 - 2(52)(77)(**cos**40)

a2 = 2704 + 5929 – 6134.48

a2 = 2498.52

a = = 49.98

**Example #3**

44

30

42

x

**Step #1 – Identify which situation you have, SAS or SSS**

SSS

**Step #2 – Label your sides and angles (As long as sides and angles are opposite each other, it doesn’t matter where the letters go)**

44

30

42

x

A

B

C

a

b

c

**Step #3 – Pick the appropriate formula based on the angle you are missing**

Angle B is missing, therefore...

**Step #4 – Solve**

Angle B = 66.04°

**Example #4**

17

12

7

x

**Step #1 – Identify which situation you have, SAS or SSS**

SSS

**Step #2 – Label your sides and angles (As long as sides and angles are opposite each other, it doesn’t matter where the letters go)**

17

12

7

x

A

B

C

a

b

c

**Step #3 – Pick the appropriate formula based on the angle you are missing**

Angle C is missing, therefore...

**Step #4 – Solve**

Angle C = 124.84°