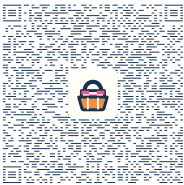


Geometry Trigonometry Workbook

4 lessons · printable · answer key at the back



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Similar Figures

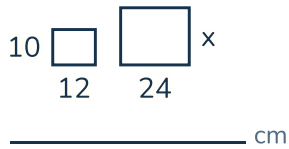
WORKED EXAMPLE



1. Similar figures and scale

Each pair of shapes is the same shape at two sizes. Find the missing length.

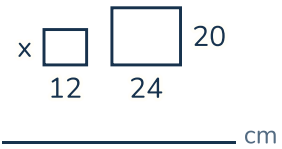
1



2



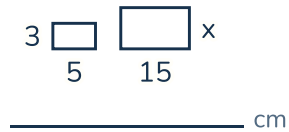
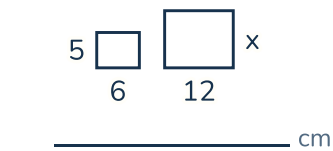
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4

5

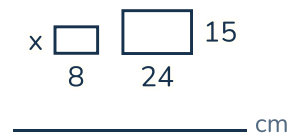
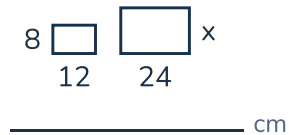
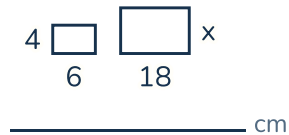
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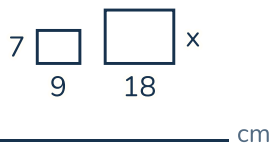
7

8

9



10

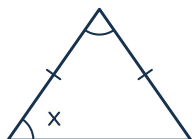


2. Angles in an isosceles triangle

Find the angle marked x . The ticks mark the two equal sides.

11

70°



_____ degrees

12

90°



_____ degrees

13

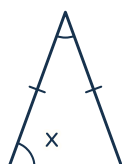
x



_____ degrees

14

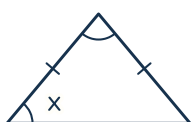
40°



_____ degrees

15

80°



_____ degrees

16

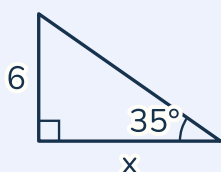
x



_____ degrees

Right Triangle Trigonometry

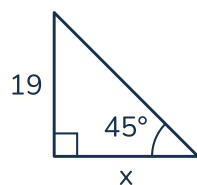
WORKED EXAMPLE

**8.6** cm

3. Right-triangle trigonometry

Find the side marked x , to one decimal place. Use a calculator.

1



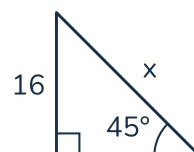
_____ cm

2



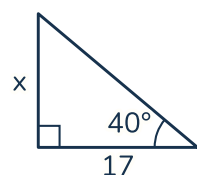
_____ cm

3



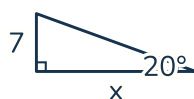
_____ cm

4



_____ cm

5



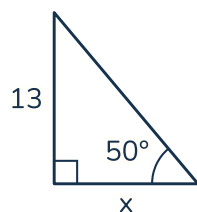
_____ cm

6



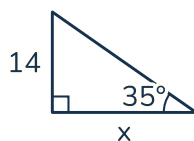
_____ cm

7



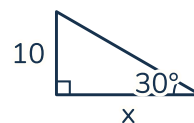
_____ cm

8



_____ cm

9



_____ cm

10

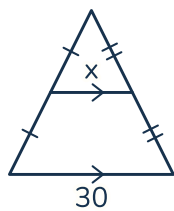


_____ cm

4. The midsegment of a triangle

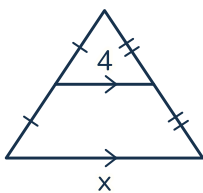
Find the length marked x . The dashes mark equal halves.

11



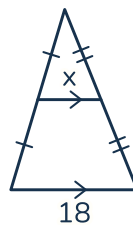
_____ cm

12



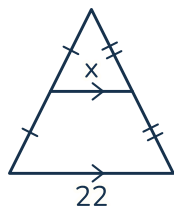
_____ cm

13



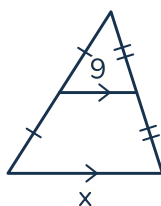
_____ cm

14



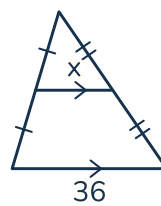
_____ cm

15



_____ cm

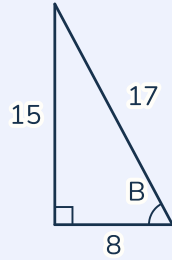
16



_____ cm

Trigonometric Ratios

WORKED EXAMPLE

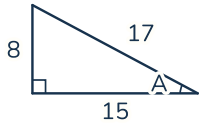


$$\cos B = \frac{8}{17}$$

5. Write a trigonometric ratio

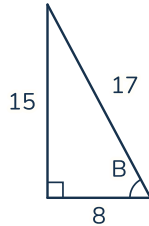
Write each ratio as a fraction. Read the sides straight off the triangle.

1



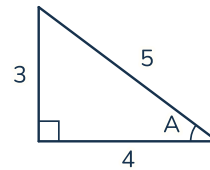
$$\sin A = \underline{\hspace{2cm}}$$

2



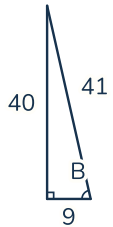
$$\tan B = \underline{\hspace{2cm}}$$

3



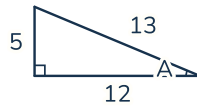
$$\sin A = \underline{\hspace{2cm}}$$

4



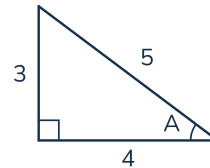
$$\tan B = \underline{\hspace{2cm}}$$

5



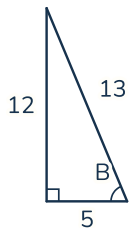
$$\sin A = \underline{\hspace{2cm}}$$

6



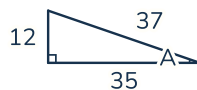
$$\tan A = \underline{\hspace{2cm}}$$

7



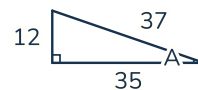
$$\sin B = \underline{\hspace{2cm}}$$

8



$$\tan A = \underline{\hspace{2cm}}$$

9

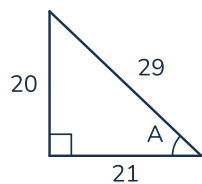


$$\sin A = \underline{\hspace{2cm}}$$

5. Write a trigonometric ratio (continued)

Write each ratio as a fraction. Read the sides straight off the triangle.

10

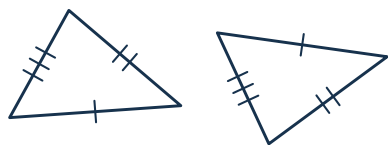


$\tan A = \underline{\hspace{2cm}}$

6. Which congruence rule (SSS, SAS, ASA, AAS, HL)

Which rule shows each pair of triangles is congruent?

11



SSS

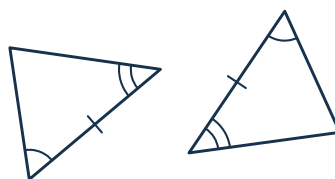
SAS

ASA

AAS

HL

12



SSS

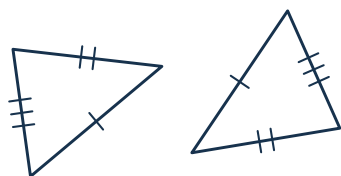
SAS

ASA

AAS

HL

13



SSS

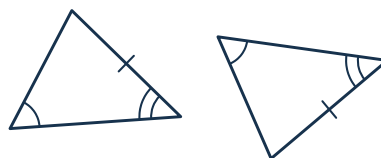
SAS

ASA

AAS

HL

14



SSS

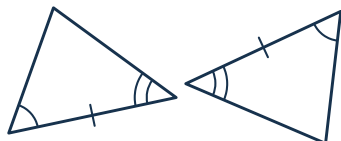
SAS

ASA

AAS

HL

15



SSS

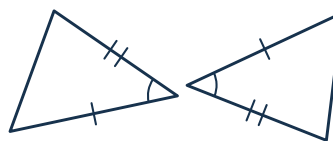
SAS

ASA

AAS

HL

16



SSS

SAS

ASA

AAS

HL

The Laws of Sines and Cosines

WORKED EXAMPLE

In $\triangle ABC$, $a = 7$, $\angle A = 50^\circ$, $\angle B = 60^\circ$. Find b : **7.9**

7. Laws of sines and cosines

Use the law of sines. Round each length to one decimal place.

- 1 In $\triangle ABC$, $a = 6$, $\angle A = 60^\circ$, $\angle B = 45^\circ$. Find b :

- 2 In $\triangle ABC$, $a = 9$, $\angle A = 45^\circ$, $\angle B = 55^\circ$. Find b :

- 3 In $\triangle ABC$, $a = 7$, $\angle A = 40^\circ$, $\angle B = 60^\circ$. Find b :

- 4 In $\triangle ABC$, $a = 10$, $\angle A = 50^\circ$, $\angle B = 70^\circ$. Find b :

- 5 In $\triangle ABC$, $a = 12$, $\angle A = 40^\circ$, $\angle B = 50^\circ$. Find b :

- 6 In $\triangle ABC$, $a = 9$, $\angle A = 65^\circ$, $\angle B = 40^\circ$. Find b :

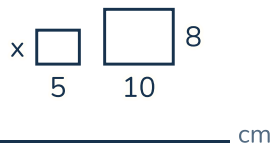
- 7 In $\triangle ABC$, $a = 5$, $\angle A = 55^\circ$, $\angle B = 65^\circ$. Find b :

- 8 In $\triangle ABC$, $a = 11$, $\angle A = 30^\circ$, $\angle B = 75^\circ$. Find b :

8. Similar figures and scale

Each pair of shapes is the same shape at two sizes. Find the missing length.

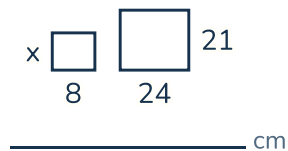
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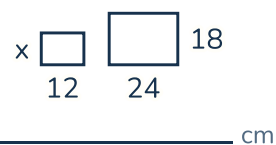
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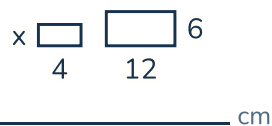
11



12



13



14



Answer Key

Similar Figures

Similar figures and scale

1. 12 by 10 and 24 by x: 20
2. 12 by 2 and 24 by x: 4
3. 12 by x and 24 by 20: 10
4. 6 by 5 and 12 by x: 10
5. 5 by 3 and 15 by x: 9
6. 10 by x and 20 by 4: 2
7. 6 by 4 and 18 by x: 12
8. 12 by 8 and 24 by x: 16
9. 8 by x and 24 by 15: 5
10. 9 by 7 and 18 by x: 14

Angles in an isosceles triangle

11. apex 70° : 55°
12. apex 90° : 45°
13. base 70° : 40°
14. apex 40° : 70°
15. apex 80° : 50°
16. base 40° : 100°

Right Triangle Trigonometry

Right-triangle trigonometry

1. 45° , opp 19 $\rightarrow$ adj x = 19
2. 25° , opp 8 $\rightarrow$ hyp x = 18.9
3. 45° , opp 16 $\rightarrow$ hyp x = 22.6
4. 40° , adj 17 $\rightarrow$ opp x = 14.3
5. 20° , opp 7 $\rightarrow$ adj x = 19.2
6. 25° , opp 11 $\rightarrow$ adj x = 23.6
7. 50° , opp 13 $\rightarrow$ adj x = 10.9
8. 35° , opp 14 $\rightarrow$ adj x = 20
9. 30° , opp 10 $\rightarrow$ adj x = 17.3
10. 70° , hyp 8 $\rightarrow$ opp x = 7.5

The midsegment of a triangle

11. base 30: 15 cm
12. midsegment 4: 8 cm
13. base 18: 9 cm
14. base 22: 11 cm
15. midsegment 9: 18 cm
16. base 36: 18 cm

Trigonometric Ratios

Write a trigonometric ratio

1. $\sin A$ (legs 8, 15, hyp 17) = $8/17$
2. $\tan B$ (legs 15, 8, hyp 17) = $15/8$
3. $\sin A$ (legs 3, 4, hyp 5) = $3/5$

Trigonometric Ratios (continued)

Write a trigonometric ratio (continued)

4. $\tan B$ (legs 40, 9, hyp 41) = $40/9$
5. $\sin A$ (legs 5, 12, hyp 13) = $5/13$
6. $\tan A$ (legs 3, 4, hyp 5) = $3/4$
7. $\sin B$ (legs 12, 5, hyp 13) = $12/13$
8. $\tan A$ (legs 12, 35, hyp 37) = $12/35$
9. $\sin A$ (legs 12, 35, hyp 37) = $12/37$
10. $\tan A$ (legs 20, 21, hyp 29) = $20/21$

Which congruence rule (SSS, SAS, ASA, AAS, HL)

11. marked 3 sides: SSS
12. marked 1 side, 2 angles: ASA
13. marked 3 sides: SSS
14. marked 1 side, 2 angles: AAS
15. marked 1 side, 2 angles: ASA
16. marked 2 sides, 1 angle: SAS

The Laws of Sines and Cosines

Laws of sines and cosines

1. In $\triangle ABC$, $a = 6$, $\angle A = 60^\circ$, $\angle B = 45^\circ$. Find b: 4.9
2. In $\triangle ABC$, $a = 9$, $\angle A = 45^\circ$, $\angle B = 55^\circ$. Find b: 10.4
3. In $\triangle ABC$, $a = 7$, $\angle A = 40^\circ$, $\angle B = 60^\circ$. Find b: 9.4
4. In $\triangle ABC$, $a = 10$, $\angle A = 50^\circ$, $\angle B = 70^\circ$. Find b: 12.3
5. In $\triangle ABC$, $a = 12$, $\angle A = 40^\circ$, $\angle B = 50^\circ$. Find b: 14.3
6. In $\triangle ABC$, $a = 9$, $\angle A = 65^\circ$, $\angle B = 40^\circ$. Find b: 6.4
7. In $\triangle ABC$, $a = 5$, $\angle A = 55^\circ$, $\angle B = 65^\circ$. Find b: 5.5
8. In $\triangle ABC$, $a = 11$, $\angle A = 30^\circ$, $\angle B = 75^\circ$. Find b: 21.3

Similar figures and scale

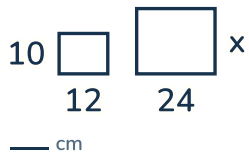
9. 5 by x and 10 by 8: 4
10. 11 by 2 and 22 by x: 4
11. 8 by x and 24 by 21: 7
12. 12 by x and 24 by 18: 9
13. 4 by x and 12 by 6: 2
14. 8 by x and 16 by 4: 2

Solutions (1 of 7)

Similar Figures

Similar figures and scale

1.



20 cm

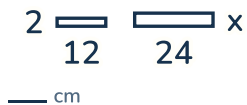
Two shapes, the same shape at two sizes. Every side of the big one is the matching side of the small one multiplied by the SAME number — so the first job is to pair the sides up: long with long, short with short.

Use the pair you can see both of. 12 became 24, and $24 \div 12 = 2$ — so every side is 2 times bigger.

Now the missing side is on the BIG shape, so it grows: $10 \times 2 = 20$.

Check it against the picture: the answer should be bigger than 10, and 20 is. So the missing side is 20 cm.

2.



4 cm

Two shapes, the same shape at two sizes. Every side of the big one is the matching side of the small one multiplied by the SAME number — so the first job is to pair the sides up: long with long, short with short.

Use the pair you can see both of. 12 became 24, and $24 \div 12 = 2$ — so every side is 2 times bigger.

Now the missing side is on the BIG shape, so it grows: $2 \times 2 = 4$.

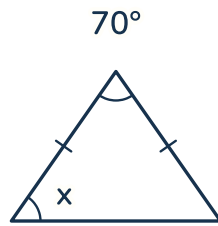
Check it against the picture: the answer should be bigger than 2, and 4 is. So the missing side is 4 cm.

Solutions (2 of 7)

Similar Figures (continued)

Angles in an isosceles triangle

11.



— degrees

base = base and

$$\text{sum} = 180^\circ$$

$$110 \div 2 = 55$$

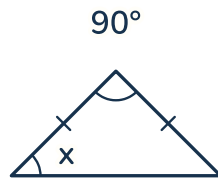
$$x = 55^\circ$$

The two ticked sides are equal, so the two base angles are equal — and the three angles still add to 180° .

The apex is 70° , so the two base angles share the other 110° equally: $(180 - 70) \div 2 = 55$.

So $x = 55^\circ$.

12.



— degrees

base = base and

$$\text{sum} = 180^\circ$$

$$90 \div 2 = 45$$

$$x = 45^\circ$$

The two ticked sides are equal, so the two base angles are equal — and the three angles still add to 180° .

The apex is 90° , so the two base angles share the other 90° equally: $(180 - 90) \div 2 = 45$.

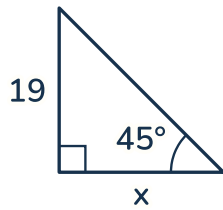
So $x = 45^\circ$.

Solutions (3 of 7)

Right Triangle Trigonometry

Right-triangle trigonometry

1.



— cm

opposite ÷ adjacent =

tangent

$$\tan 45^\circ = 19 \div x$$

$$x = 19$$

The angle is 45°. You know the opposite (19) and you want the adjacent (x). Those two sides are the opposite and the adjacent, so the ratio is the tangent.

Write it with the numbers: $\tan 45^\circ = 19 \div x$.

Rearrange for x and work it out on a calculator: $x = 19 \div \tan 45^\circ = 19$.

2.



— cm

opposite ÷ hypotenuse =

sine

$$\sin 25^\circ = 8 \div x$$

$$x = 18.9$$

The angle is 25°. You know the opposite (8) and you want the hypotenuse (x). Those two sides are the opposite and the hypotenuse, so the ratio is the sine.

Write it with the numbers: $\sin 25^\circ = 8 \div x$.

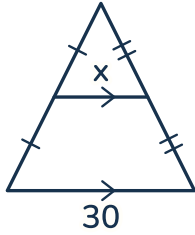
Rearrange for x and work it out on a calculator: $x = 8 \div \sin 25^\circ = 18.9$.

Solutions (4 of 7)

Right Triangle Trigonometry (continued)

The midsegment of a triangle

11.



— cm

midsegment =

half the base

$$30 \div 2 = 15$$

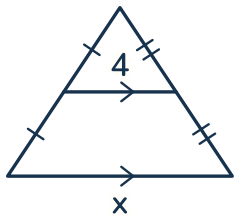
$$x = 15 \text{ cm}$$

A midsegment joins the midpoints of two sides, and it is half the length of the third side — so the base is always twice the midsegment.

The base is 30 cm, so the midsegment is half of it:
 $30 \div 2 = 15$.

So $x = 15$ cm.

12.



— cm

midsegment =

half the base

$$4 \times 2 = 8$$

$$x = 8 \text{ cm}$$

A midsegment joins the midpoints of two sides, and it is half the length of the third side — so the base is always twice the midsegment.

The midsegment is 4 cm, so the base is twice it: $4 \times 2 = 8$.

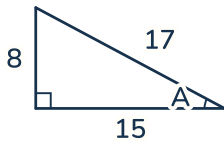
So $x = 8$ cm.

Solutions (5 of 7)

Trigonometric Ratios

Write a trigonometric ratio

1.



$\sin A = \underline{\hspace{2cm}}$

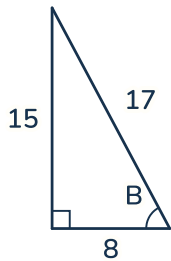
$$\sin A = \frac{8}{17}$$

$\sin A$ is opposite over hypotenuse. Name the two sides you need, measured from angle A .

Read them off the triangle: the opposite side of angle A is 8, the hypotenuse is 17.

So $\sin A = 8/17$.

2.



$\tan B = \underline{\hspace{2cm}}$

$$\tan B = \frac{15}{8}$$

$\tan B$ is opposite over adjacent. Name the two sides you need, measured from angle B .

Read them off the triangle: the opposite side of angle B is 15, the adjacent is 8.

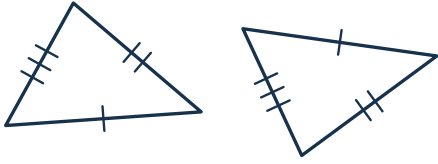
So $\tan B = 15/8$.

Solutions (6 of 7)

Trigonometric Ratios (continued)

Which congruence rule (SSS, SAS, ASA, AAS, HL)

11.



SSS

SAS

ASA

AAS

HL

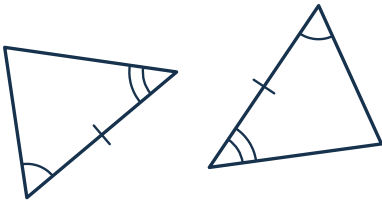
SSS

Read the marks first — they are the givens. Here there are three pairs of equal sides, and no angles.

Three pairs of equal sides pin a triangle down completely — there is only one triangle with those three lengths.

So the rule is SSS.

12.



SSS

SAS

ASA

AAS

HL

ASA

Read the marks first — they are the givens. Here there are two pairs of equal angles and one pair of equal sides.

The marked side sits BETWEEN the two marked angles — an included side. Two angles and the side between them fix the triangle where the arms meet.

So the rule is ASA.

Solutions (7 of 7)

The Laws of Sines and Cosines

Laws of sines and cosines

1. In $\triangle ABC$, $a = 6$, $\angle A = 60^\circ$, $\angle B = 45^\circ$. Find b : _____

$$b = a \cdot \sin B / \sin A$$

$$b = 6 \cdot \sin 45^\circ / \sin 60^\circ$$

$$b \approx 4.9$$

Two angles and the side opposite one — that is the law of sines: $a/\sin A = b/\sin B$.

Substitute $a = 6$, $A = 60^\circ$, $B = 45^\circ$.

Evaluate and round to one place: $b \approx 4.9$.

2. In $\triangle ABC$, $a = 9$, $\angle A = 45^\circ$, $\angle B = 55^\circ$. Find b : _____

$$b = a \cdot \sin B / \sin A$$

$$b = 9 \cdot \sin 55^\circ / \sin 45^\circ$$

$$b \approx 10.4$$

Two angles and the side opposite one — that is the law of sines: $a/\sin A = b/\sin B$.

Substitute $a = 9$, $A = 45^\circ$, $B = 55^\circ$.

Evaluate and round to one place: $b \approx 10.4$.