

Geometry Math Workbook

21 lessons · printable · answer key at the back

Name _____

Date _____

Contents (1 of 2)

Chapter 1 · Lines and Angles	
1-1 Angle Pairs	1
1-2 Exterior Angles	2
1-3 Angles in Polygons	3
Chapter 2 · Triangles	
2-1 The Triangle Inequality	4
2-2 Isosceles Triangles	6
2-3 Midsegments	8
2-4 Congruence Criteria	10
Chapter 3 · Proof	
3-1 Proofs with Triangles	12
3-2 Proofs with Similar Triangles	14
3-3 Writing a Proof	16

Contents (2 of 2)

Chapter 4 · Similarity and Trigonometry 18

4-1 Similar Figures 18

4-2 Right Triangle Trigonometry 20

4-3 Trigonometric Ratios 22

4-4 The Laws of Sines and Cosines 24

Chapter 5 · Circles 25

5-1 Parts of a Circle 25

5-2 Inscribed Angles 27

5-3 Triangles and Circles 29

Chapter 6 · Coordinates and Solids 31

6-1 Midpoints 31

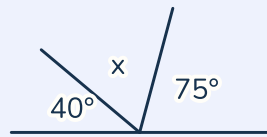
6-2 Parts of a Solid 33

6-3 Missing Edges 35

6-4 Surface Area of a Sphere 37

Angle Pairs

WORKED EXAMPLE

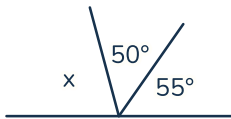


65 degrees

1. Angles on a line and around a point

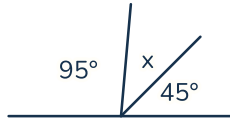
Find the angle marked x . The angles on each line add to 180° .

1



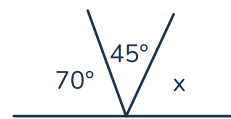
_____ degrees

2



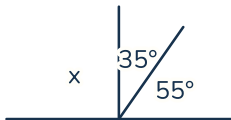
_____ degrees

3



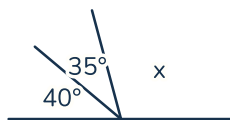
_____ degrees

4



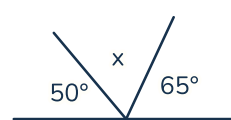
_____ degrees

5



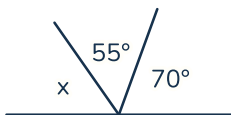
_____ degrees

6



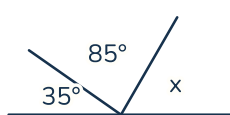
_____ degrees

7



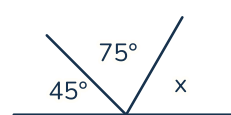
_____ degrees

8



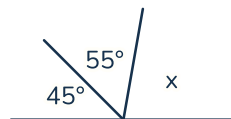
_____ degrees

9



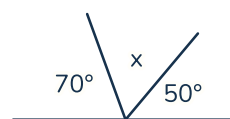
_____ degrees

10



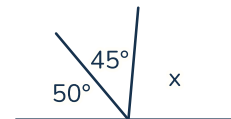
_____ degrees

11



_____ degrees

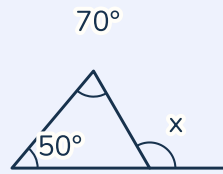
12



_____ degrees

Exterior Angles

WORKED EXAMPLE



120 degrees

2. The exterior angle of a triangle

Find the angle marked x . Give each answer in degrees.

1



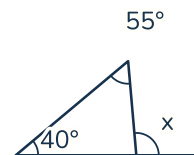
_____ degrees

2



_____ degrees

3



_____ degrees

4



_____ degrees

5



_____ degrees

6



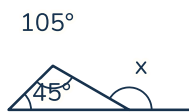
_____ degrees

7



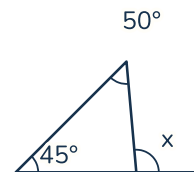
_____ degrees

8



_____ degrees

9



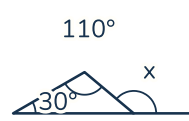
_____ degrees

10



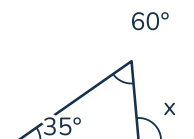
_____ degrees

11



_____ degrees

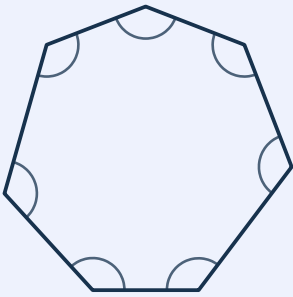
12



_____ degrees

Angles in Polygons

WORKED EXAMPLE



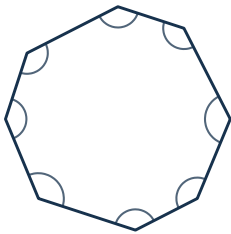
All the angles together

900 degrees

3. Angles inside a polygon

Work out the angle each shape is asking for. Give every answer in degrees.

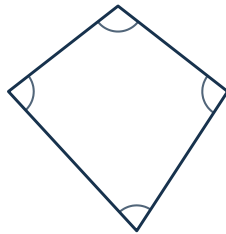
1



All the angles together

_____ degrees

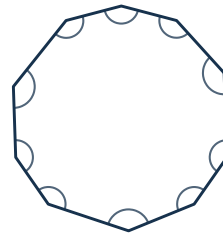
2



All the angles together

_____ degrees

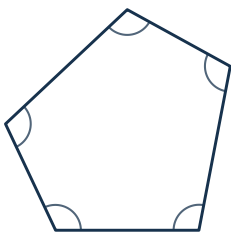
3



All the angles together

_____ degrees

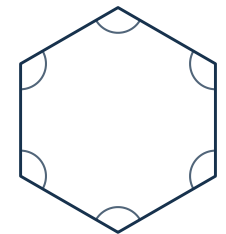
4



All the angles together

_____ degrees

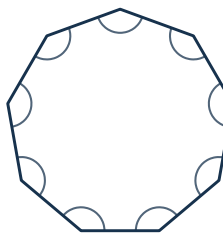
5



All the angles together

_____ degrees

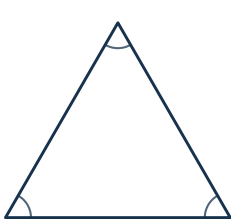
6



All the angles together

_____ degrees

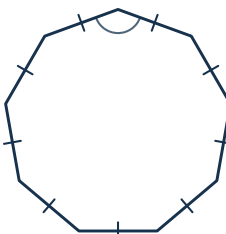
7



All the angles together

_____ degrees

8



Each of its angles

_____ degrees

The Triangle Inequality

WORKED EXAMPLE

_____ 6
 _____ 12
 _____ 12

Yes

No

4. Can these be the sides of a triangle?

Can these three lengths form a triangle? Answer Yes or No.

1

_____ 6
 _____ 10
 _____ 11

Yes

No

2

_____ 4
 _____ 6
 _____ 12

Yes

No

3

_____ 7
 _____ 8
 _____ 9

Yes

No

4

_____ 11
 _____ 16
 _____ 16

Yes

No

5

_____ 9
 _____ 10
 _____ 11

Yes

No

6

_____ 3
 _____ 11
 _____ 16

Yes

No

7

_____ 3
 _____ 9
 _____ 11

Yes

No

8

_____ 14
 _____ 14
 _____ 14

Yes

No

9

_____ 10
 _____ 11
 _____ 13

Yes

No

10

_____ 3
 _____ 15
 _____ 15

Yes

No

11

_____ 13
 _____ 13
 _____ 13

Yes

No

12

_____ 8
 _____ 13
 _____ 16

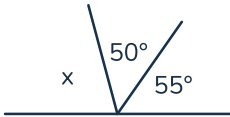
Yes

No

5. Angles on a line and around a point

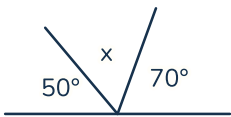
Find the angle marked x. The angles on each line add to 180°.

13



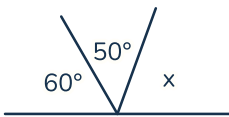
_____ degrees

14



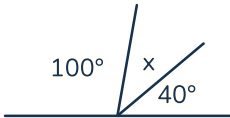
_____ degrees

15



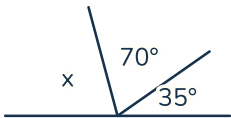
_____ degrees

16



_____ degrees

17



_____ degrees

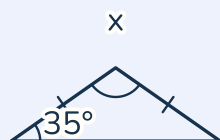
18



_____ degrees

Isosceles Triangles

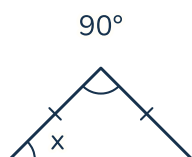
WORKED EXAMPLE

**110** degrees

6. Angles in an isosceles triangle

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

1



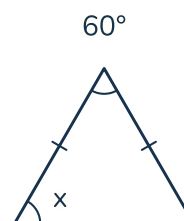
_____ degrees

2



_____ degrees

3



_____ degrees

4



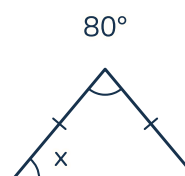
_____ degrees

5



_____ degrees

6



_____ degrees

7



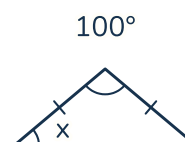
_____ degrees

8



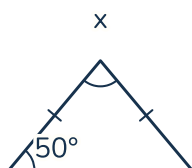
_____ degrees

9



_____ degrees

10



_____ degrees

7. The exterior angle of a triangle

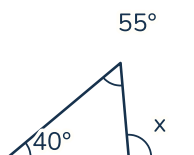
Find the angle marked x . Give each answer in degrees.

11



_____ degrees

12



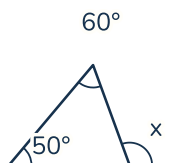
_____ degrees

13



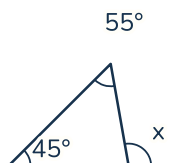
_____ degrees

14



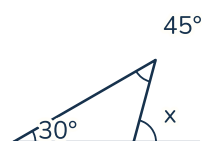
_____ degrees

15



_____ degrees

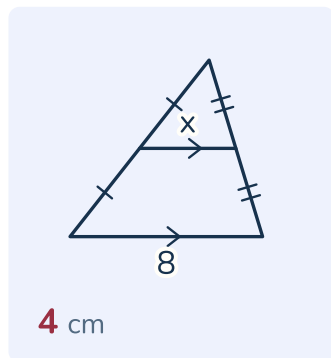
16



_____ degrees

Midsegments

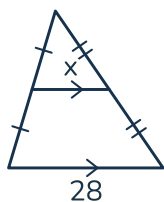
WORKED EXAMPLE



8. The midsegment of a triangle

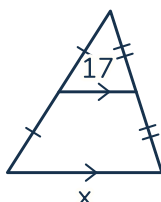
Find the length marked x . The dashes mark equal halves.

1



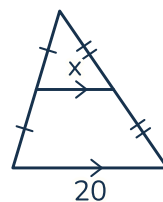
_____ cm

2



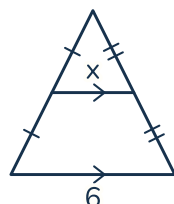
_____ cm

3



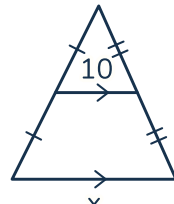
_____ cm

4



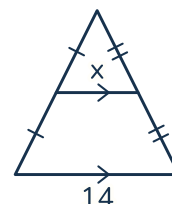
_____ cm

5



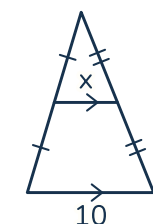
_____ cm

6



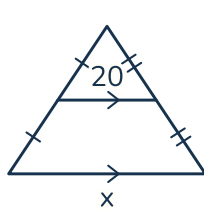
_____ cm

7



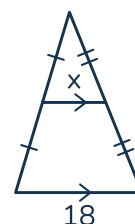
_____ cm

8



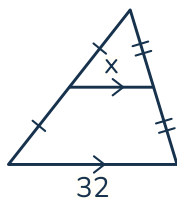
_____ cm

9



_____ cm

10

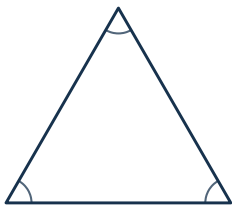


_____ cm

9. Angles inside a polygon

Work out the angle each shape is asking for. Give every answer in degrees.

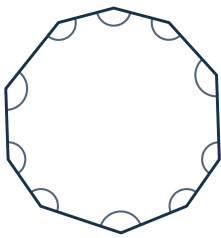
11



All the angles together

_____ degrees

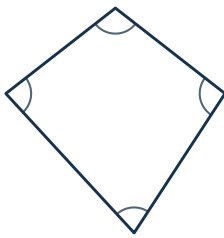
12



All the angles together

_____ degrees

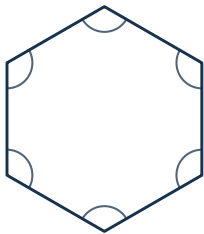
13



All the angles together

_____ degrees

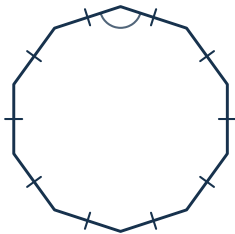
14



All the angles together

_____ degrees

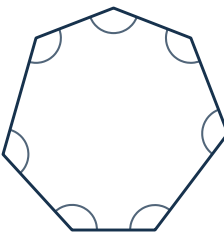
15



Each of its angles

_____ degrees

16

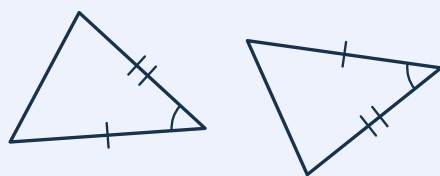


All the angles together

_____ degrees

Congruence Criteria

WORKED EXAMPLE



SSS

SAS

ASA

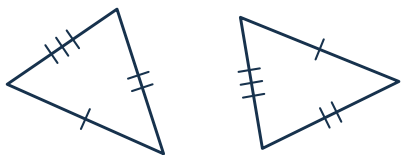
AAS

HL

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

Which rule shows each pair of triangles is congruent?

1



SSS

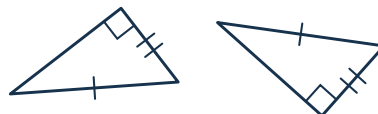
SAS

ASA

AAS

HL

2



SSS

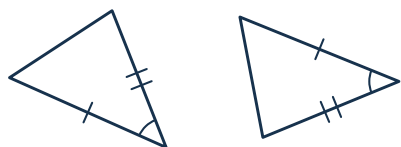
SAS

ASA

AAS

HL

3



SSS

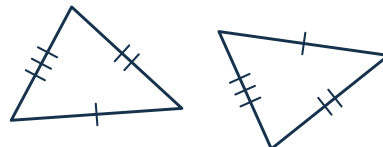
SAS

ASA

AAS

HL

4



SSS

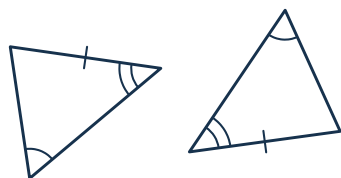
SAS

ASA

AAS

HL

5



SSS

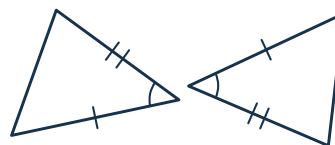
SAS

ASA

AAS

HL

6



SSS

SAS

ASA

AAS

HL

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

Which rule shows each pair of triangles is congruent?

7



SSS

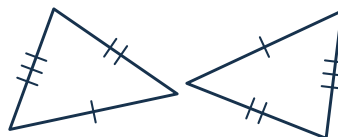
SAS

ASA

AAS

HL

8



SSS

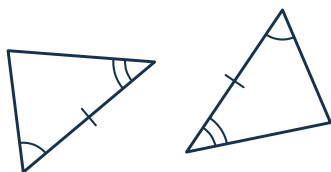
SAS

ASA

AAS

HL

9



SSS

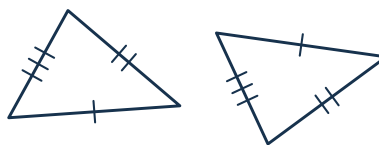
SAS

ASA

AAS

HL

10



SSS

SAS

ASA

AAS

HL

11. Can these be the sides of a triangle?

Can these three lengths form a triangle? Answer Yes or No.

11

_____ 11
_____ 12
_____ 13

Yes

No

12

_____ 6
_____ 8
_____ 12

Yes

No

13

_____ 10
_____ 11
_____ 13

Yes

No

14

_____ 9
_____ 12
_____ 12

Yes

No

15

_____ 4
_____ 4
_____ 8

Yes

No

16

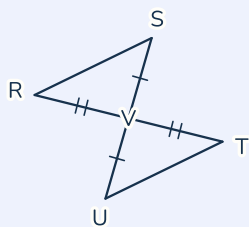
_____ 9
_____ 12
_____ 14

Yes

No

Proofs with Triangles

WORKED EXAMPLE



Given V is the midpoint of SU; $RV \cong TV$

Prove $\triangle RVS \cong \triangle TVU$

Statements	Reasons
1. $SV \cong UV$	Definition of Midpoint
2. $\angle RVS \cong \angle TVU$	?
3. $RV \cong TV$	Given
4. $\triangle RVS \cong \triangle TVU$	SAS

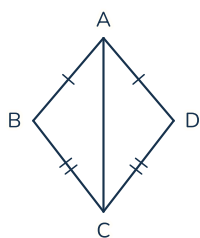
Reason for step 2:

-

12. Complete the triangle congruence proof

Read each proof and choose the missing reason.

1



Given $AB \cong AD$; $CB \cong CD$

Prove $\triangle ABC \cong \triangle ADC$

Statements	Reasons
1. $AB \cong AD$	Given
2. $CB \cong CD$	Given
3. $AC \cong AC$	?
4. $\triangle ABC \cong \triangle ADC$	SSS

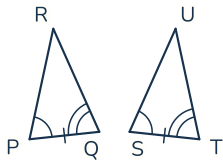
Reason for step 3:

-

12. Complete the triangle congruence proof (continued)

Read each proof and choose the missing reason.

2



Given $\angle P \cong \angle S$; $PQ \cong ST$; $\angle Q \cong \angle T$

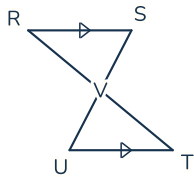
Prove $\triangle PQR \cong \triangle STU$

Statements	Reasons
1. $\angle P \cong \angle S$	Given
2. $PQ \cong ST$	Given
3. $\angle Q \cong \angle T$	Given
4. $\triangle PQR \cong \triangle STU$	?

Reason for step 4:

-

3



Given $RS \parallel UT$; $RS \cong UT$

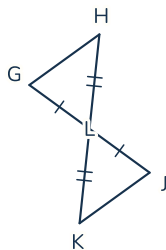
Prove $\triangle RSV \cong \triangle TUV$

Statements	Reasons
1. $\angle SRV \cong \angle UTV$	?
2. $\angle RSV \cong \angle TUV$	Alternate Interior Angles
3. $RS \cong UT$	Given
4. $\triangle RSV \cong \triangle TUV$	ASA

Reason for step 1:

-

4



Given $GL \cong JL$; $HL \cong KL$

Prove $\triangle GLH \cong \triangle JLK$

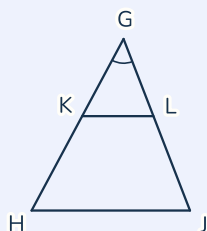
Statements	Reasons
1. $GL \cong JL$	Given
2. $\angle GLH \cong \angle JLK$	?
3. $HL \cong KL$	Given
4. $\triangle GLH \cong \triangle JLK$	SAS

Reason for step 2:

-

Proofs with Similar Triangles

WORKED EXAMPLE



Given $GK/GH = GL/GI$

Prove $\triangle GKL \sim \triangle GHI$

Statements	Reasons
1. $\angle G \cong \angle G$	?
2. $GK/GH = GL/GI$	Given
3. $\triangle GKL \sim \triangle GHI$	SAS ~

Reason for step 1:

Given

Reflexive Property

Vertical Angles

Corresponding Angles

Alternate Interior Angles

AA ~

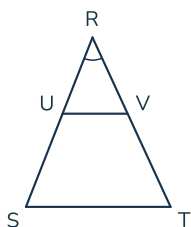
SAS ~

SSS ~

13. Complete the similar-triangle proof

Read each proof and choose the missing reason.

1



Given $RU/RS = RV/RT$

Prove $\triangle RUV \sim \triangle RST$

Statements	Reasons
1. $\angle R \cong \angle R$	?
2. $RU/RS = RV/RT$	Given
3. $\triangle RUV \sim \triangle RST$	SAS ~

Reason for step 1:

Given

Reflexive Property

Vertical Angles

Corresponding Angles

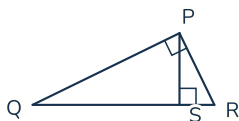
Alternate Interior Angles

AA ~

SAS ~

SSS ~

2



Given $\angle QPR$ is a right angle; $PS \perp QR$

Prove $\triangle SPR \sim \triangle PQR$

Statements	Reasons
1. $\angle R \cong \angle R$	Reflexive Property
2. $\angle PSR \cong \angle QPR$	Right angles are congruent
3. $\triangle SPR \sim \triangle PQR$	?

Reason for step 3:

Given

Reflexive Property

Vertical Angles

Corresponding Angles

Alternate Interior Angles

AA ~

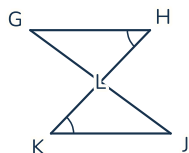
SAS ~

SSS ~

13. Complete the similar-triangle proof (continued)

Read each proof and choose the missing reason.

3



Given $\angle GHL \cong \angle JKL$

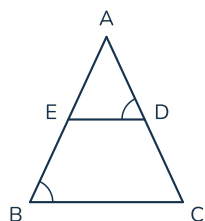
Prove $\triangle GHL \sim \triangle JKL$

Statements	Reasons
1. $\angle GHL \cong \angle JKL$	?
2. $\angle GLH \cong \angle JLK$	Vertical Angles
3. $\triangle GHL \sim \triangle JKL$	AA ~

Reason for step 1:

-

4



Given $\angle ADE \cong \angle B$

Prove $\triangle ADE \sim \triangle ABC$

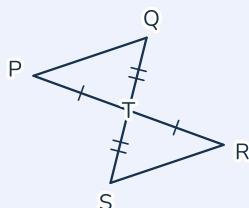
Statements	Reasons
1. $\angle A \cong \angle A$	Reflexive Property
2. $\angle ADE \cong \angle B$	?
3. $\triangle ADE \sim \triangle ABC$	AA ~

Reason for step 2:

-

Writing a Proof

WORKED EXAMPLE



Given $PT \cong RT$; $QT \cong ST$

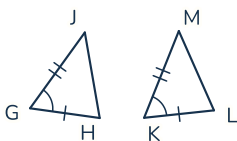
Prove $\triangle PTQ \cong \triangle RTS$

Statements	Reasons
1. $PT \cong RT$	Given
2. $\angle PTQ \cong \angle RTS$	Vertical Angles
3. $QT \cong ST$	Given
4. $\triangle PTQ \cong \triangle RTS$	SAS

14. Write a triangle proof

Write a full two-column proof for each. Reasons may be used more than once.

1

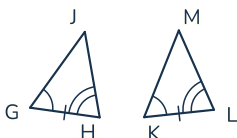


Given $GH \cong KL$; $\angle G \cong \angle K$; $GJ \cong KM$

Prove $\triangle GHJ \cong \triangle KLM$

Statements	Reasons
1.	
2.	
3.	
4.	

2



Given $\angle G \cong \angle K$; $GH \cong KL$; $\angle H \cong \angle L$

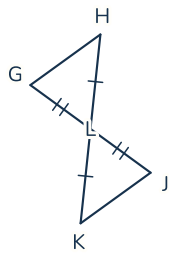
Prove $\triangle GHJ \cong \triangle KLM$

Statements	Reasons
1.	
2.	
3.	
4.	

14. Write a triangle proof (continued)

Write a full two-column proof for each. Reasons may be used more than once.

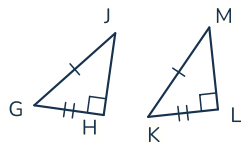
3



Given L is the midpoint of HK; $GL \cong JL$
Prove $\triangle GLH \cong \triangle JLK$

Statements	Reasons
1.	
2.	
3.	
4.	

4

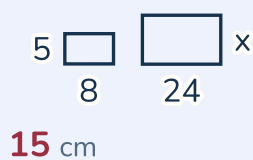


Given $\angle H$ and $\angle L$ are right angles; $GJ \cong KM$; $GH \cong KL$
Prove $\triangle GHJ \cong \triangle KLM$

Statements	Reasons
1.	
2.	
3.	
4.	

Similar Figures

WORKED EXAMPLE



15. Similar figures and scale

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

1



2



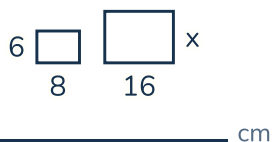
3



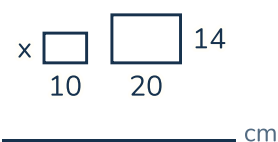
4



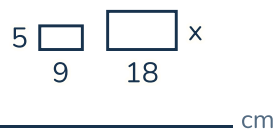
5



6



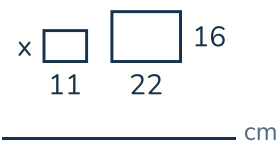
7



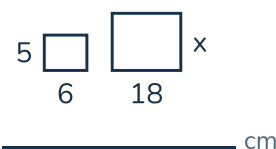
8



9



10



16. Angles in an isosceles triangle

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

11

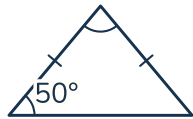
30°



_____ degrees

12

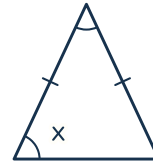
x



_____ degrees

13

50°



_____ degrees

14

x



_____ degrees

15

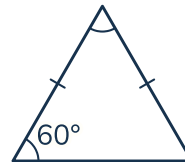
90°



_____ degrees

16

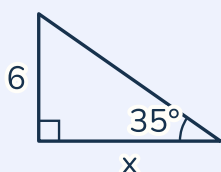
x



_____ degrees

Right Triangle Trigonometry

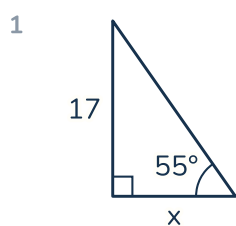
WORKED EXAMPLE



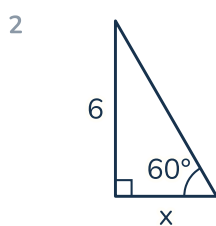
8.6 cm

17. Right-triangle trigonometry

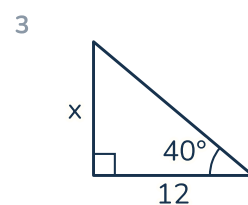
Find the side marked x , to one decimal place. Use a calculator.



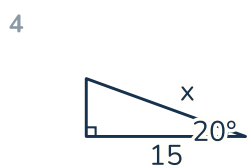
_____ cm



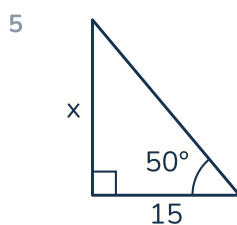
_____ cm



_____ cm



_____ cm



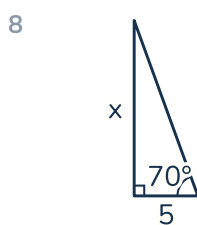
_____ cm



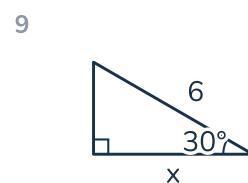
_____ cm



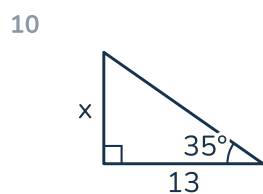
_____ cm



_____ cm



_____ cm

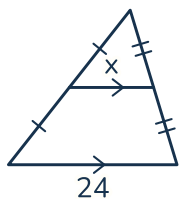


_____ cm

18. The midsegment of a triangle

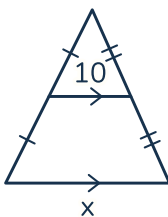
Find the length marked x . The dashes mark equal halves.

11



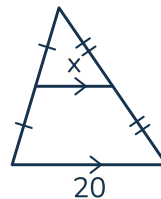
_____ cm

12



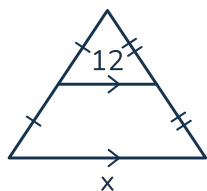
_____ cm

13



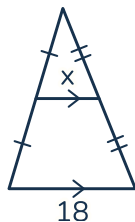
_____ cm

14



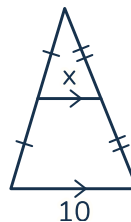
_____ cm

15



_____ cm

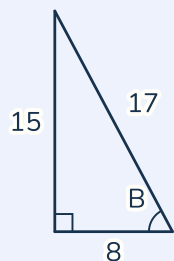
16



_____ cm

Trigonometric Ratios

WORKED EXAMPLE

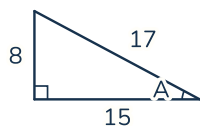


$$\cos B = \frac{8}{17}$$

19. Write a trigonometric ratio

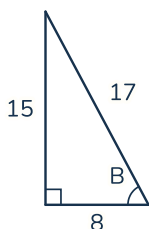
Write each ratio as a fraction. Read the sides straight off the triangle.

1



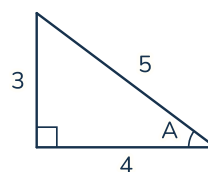
$$\sin A = \underline{\hspace{2cm}}$$

2



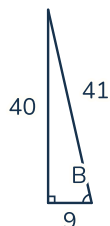
$$\tan B = \underline{\hspace{2cm}}$$

3



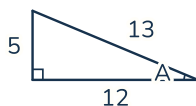
$$\sin A = \underline{\hspace{2cm}}$$

4



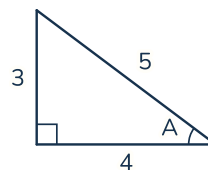
$$\tan B = \underline{\hspace{2cm}}$$

5



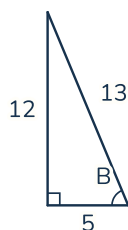
$$\sin A = \underline{\hspace{2cm}}$$

6



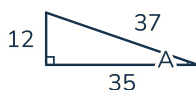
$$\tan A = \underline{\hspace{2cm}}$$

7



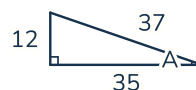
$$\sin B = \underline{\hspace{2cm}}$$

8



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

9

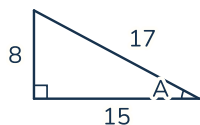


$$\tan A = \underline{\hspace{2cm}}$$

19. Write a trigonometric ratio (continued)

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

10

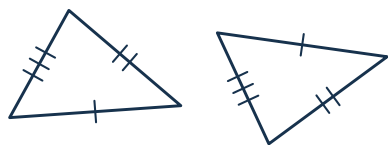


$\cos A = \underline{\hspace{2cm}}$

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

Which rule shows each pair of triangles is congruent?

11



SSS

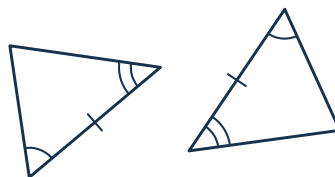
SAS

ASA

AAS

HL

12



SSS

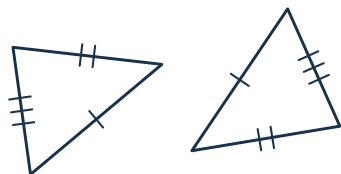
SAS

ASA

AAS

HL

13



SSS

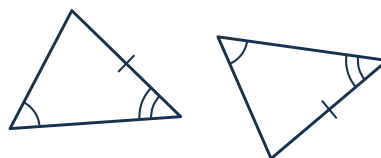
SAS

ASA

AAS

HL

14



SSS

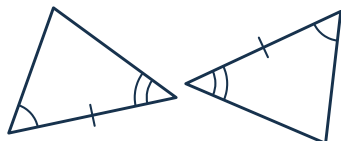
SAS

ASA

AAS

HL

15



SSS

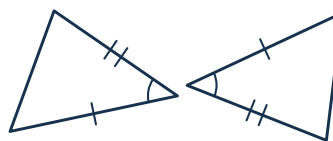
SAS

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**

21. 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 :

22. Similar figures and scale

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

- 9

_____ cm

10

_____ cm

11

_____ cm
- 12

_____ cm

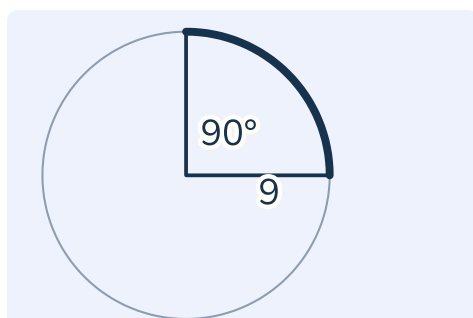
13

_____ cm

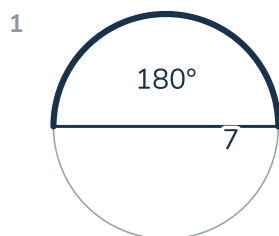
14

_____ cm

WORKED EXAMPLE

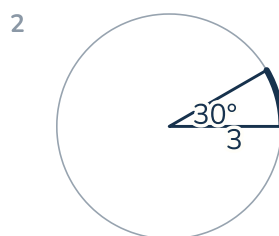


Length of the curved edge

14.13 cm**23. Arc length and sector area**Use $\pi = 3.14$. Each shape is part of a circle — find what the label asks for.

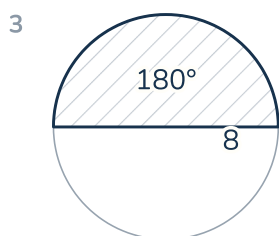
Length of the curved edge

_____ cm

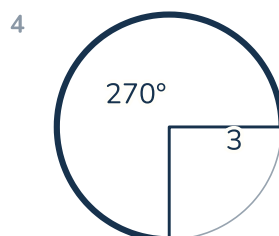


Length of the curved edge

_____ cm

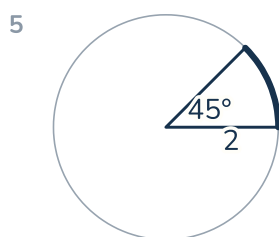


Area of the slice

_____ cm^2 

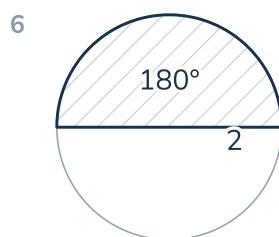
Length of the curved edge

_____ cm



Length of the curved edge

_____ cm



Area of the slice

_____ cm^2

24. Right-triangle trigonometry

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

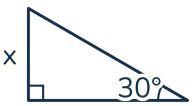
7



A right-angled triangle with a vertical side of length 13, a horizontal base, and a hypotenuse of length x. The angle between the base and the hypotenuse is 35°.

 cm

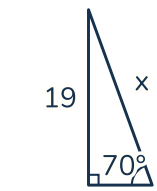
8



A right-angled triangle with a horizontal base of length 9, a vertical side of length x, and a hypotenuse. The angle between the base and the hypotenuse is 30°.

 cm

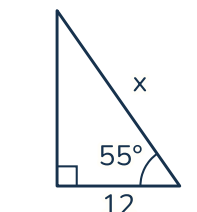
9



A right-angled triangle with a vertical side of length 19, a horizontal base, and a hypotenuse of length x. The angle between the base and the hypotenuse is 70°.

 cm

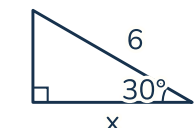
10



A right-angled triangle with a horizontal base of length 12, a vertical side, and a hypotenuse of length x. The angle between the base and the hypotenuse is 55°.

 cm

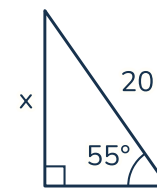
11



A right-angled triangle with a hypotenuse of length 6, a horizontal base of length x, and a vertical side. The angle between the base and the hypotenuse is 30°.

 cm

12

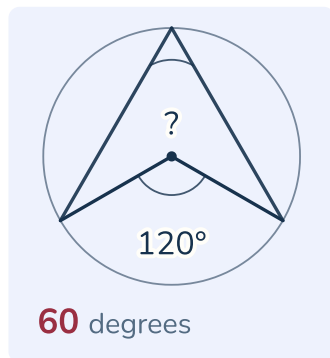


A right-angled triangle with a hypotenuse of length 20, a vertical side of length x, and a horizontal base. The angle between the base and the hypotenuse is 55°.

 cm

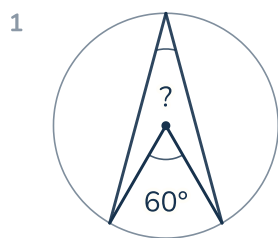
Inscribed Angles

WORKED EXAMPLE

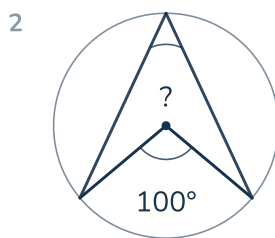


25. Inscribed angle in a circle

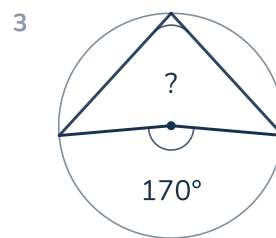
The angle at the center is given. Find the angle on the circle.



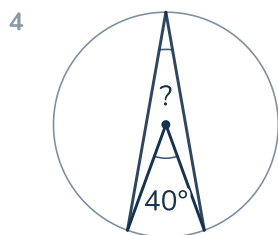
_____ degrees



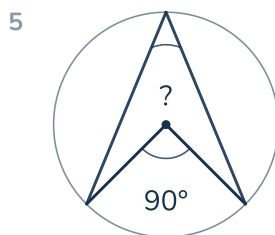
_____ degrees



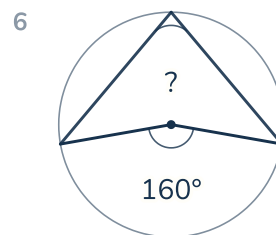
_____ degrees



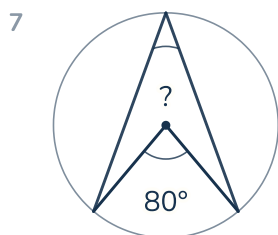
_____ degrees



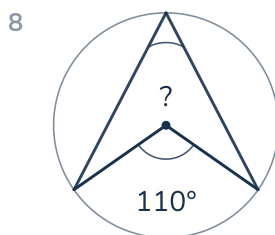
_____ degrees



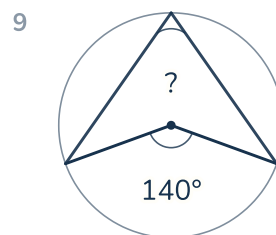
_____ degrees



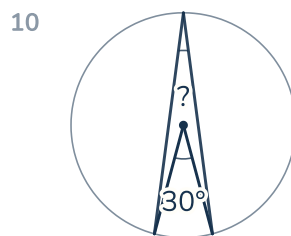
_____ degrees



_____ degrees



_____ degrees

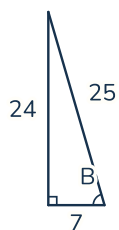


_____ degrees

26. Write a trigonometric ratio

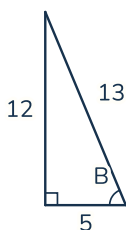
Write each ratio as a fraction. Read the sides straight off the triangle.

11



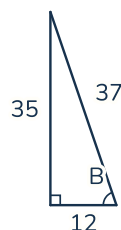
$$\sin B = \underline{\hspace{2cm}}$$

12



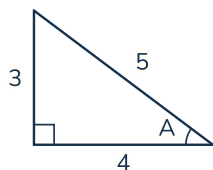
$$\tan B = \underline{\hspace{2cm}}$$

13



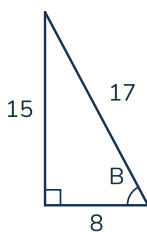
$$\sin B = \underline{\hspace{2cm}}$$

14



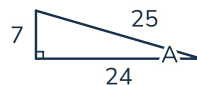
$$\tan A = \underline{\hspace{2cm}}$$

15



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

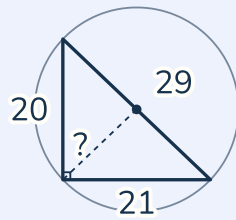
16



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

Triangles and Circles

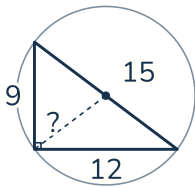
WORKED EXAMPLE

**14.5** cm

27. Circles of a right triangle

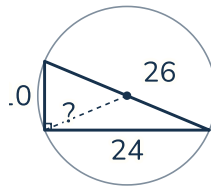
Each circle passes through all three corners. Find its radius.

1



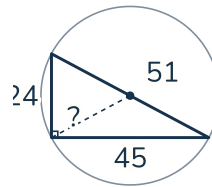
_____ cm

2



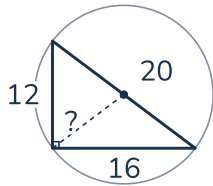
_____ cm

3



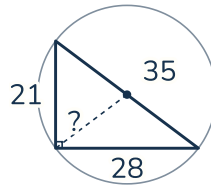
_____ cm

4



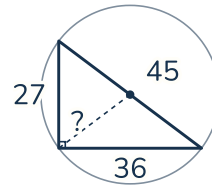
_____ cm

5



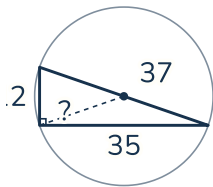
_____ cm

6



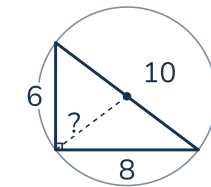
_____ cm

7



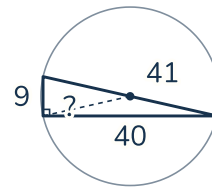
_____ cm

8



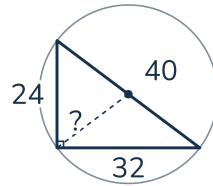
_____ cm

9



_____ cm

10



_____ cm

28. Laws of sines and cosines

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

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

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

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

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

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

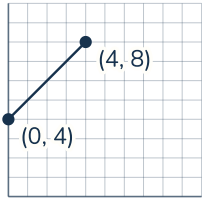
16 In $\triangle ABC$, $a = 9$, $\angle A = 65^\circ$, $\angle B = 40^\circ$. Find b :

Midpoints

29. Midpoint of a segment

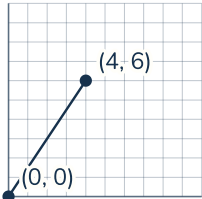
Find the midpoint of each segment.

1



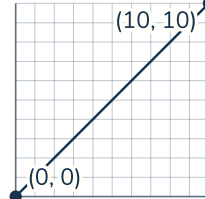
(_____ , _____)

2



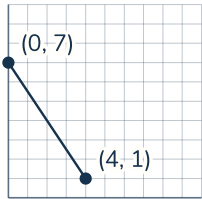
(_____ , _____)

3



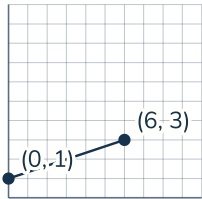
(_____ , _____)

4



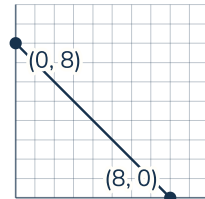
(_____ , _____)

5



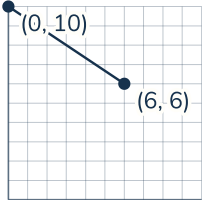
(_____ , _____)

6



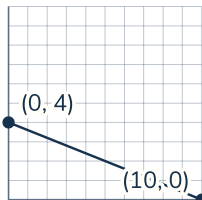
(_____ , _____)

7



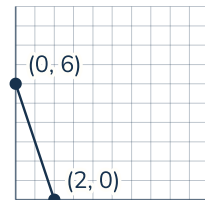
(_____ , _____)

8



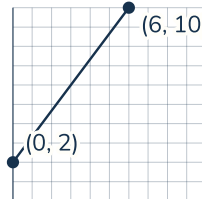
(_____ , _____)

9



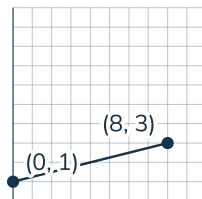
(_____ , _____)

10



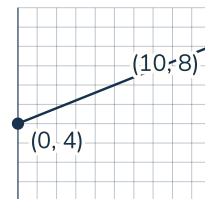
(_____ , _____)

11



(_____ , _____)

12

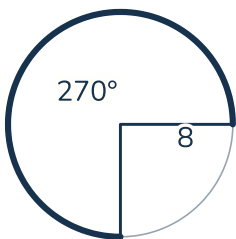


(_____ , _____)

30. Arc length and sector area

Use $\pi = 3.14$. Each shape is part of a circle — find what the label asks for.

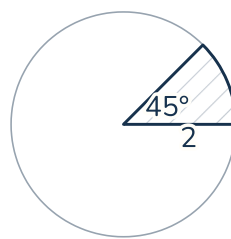
13



Length of the curved edge

_____ cm

14

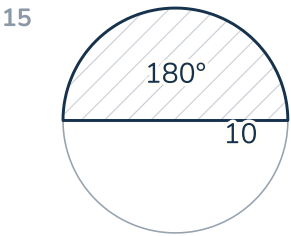


Area of the slice

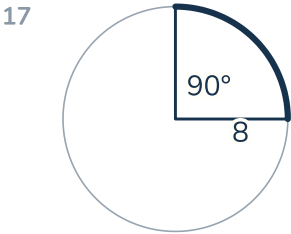
_____ cm^2

30. Arc length and sector area (continued)

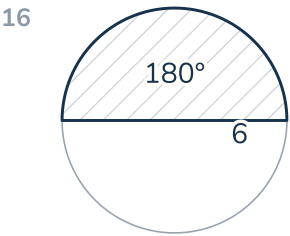
Use $\pi = 3.14$. Each shape is part of a circle — find what the label asks for.



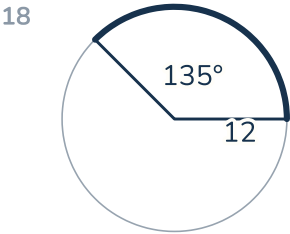
Area of the slice
_____ cm^2



Length of the curved edge
_____ cm

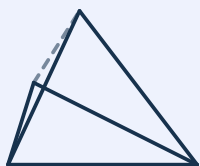


Area of the slice
_____ cm^2



Length of the curved edge
_____ cm

WORKED EXAMPLE

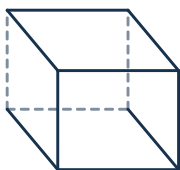


How many vertices?

4**31. Faces, edges and vertices**

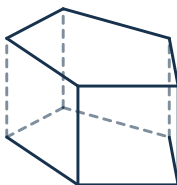
Hidden edges are dashed. Answer the question under each solid.

1



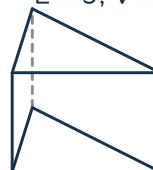
How many edges?

2



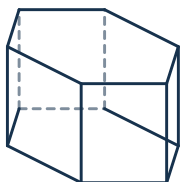
How many faces?

3

 $E = 9, V = 6$ 

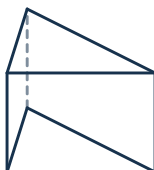
How many faces?

4



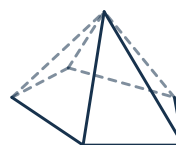
How many vertices?

5



How many faces?

6

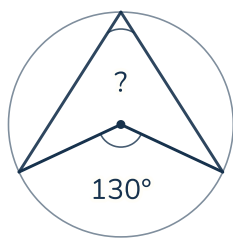
 $E = 10, V = 6$ 

How many faces?

32. Inscribed angle in a circle

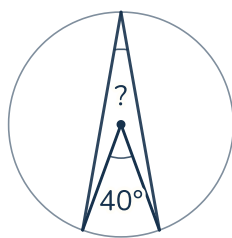
The angle at the center is given. Find the angle on the circle.

7



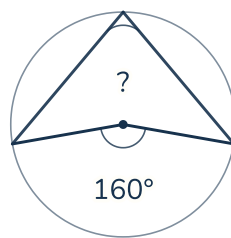
_____ degrees

8



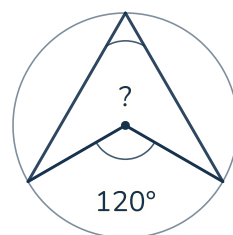
_____ degrees

9



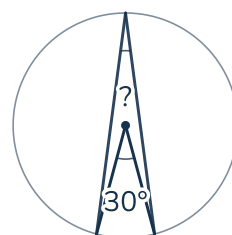
_____ degrees

10



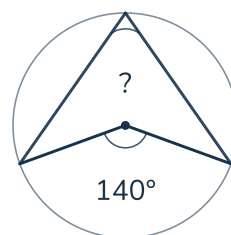
_____ degrees

11



_____ degrees

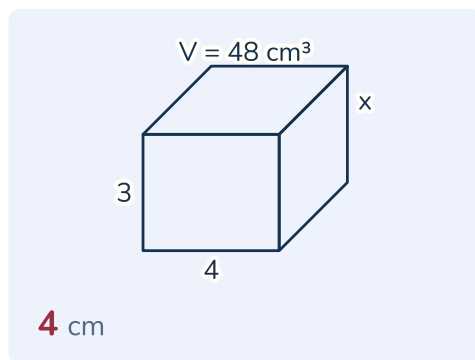
12



_____ degrees

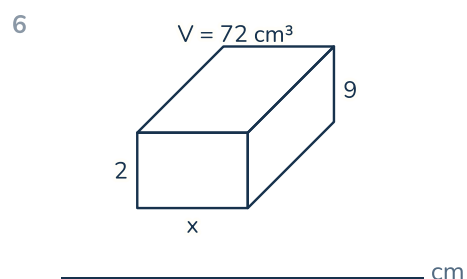
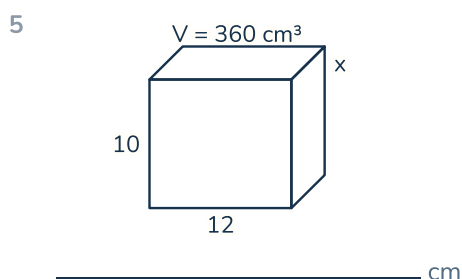
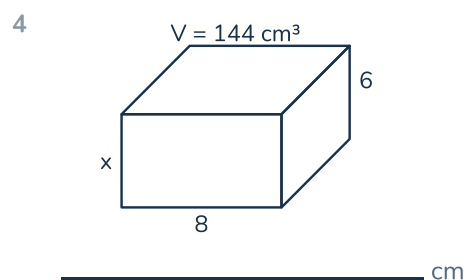
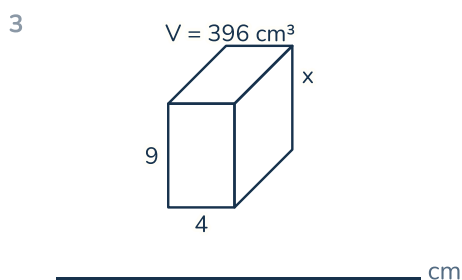
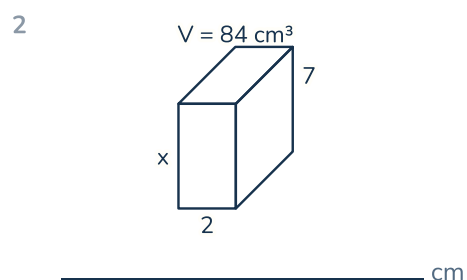
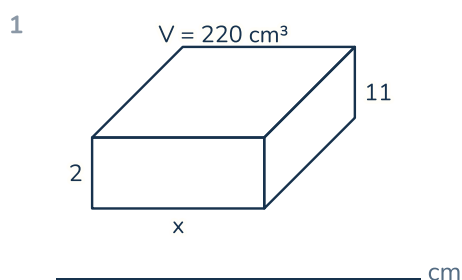
Missing Edges

WORKED EXAMPLE



33. Missing edge from the volume

The volume of each box is shown. Find the missing edge, in centimeters.



33. Missing edge from the volume (continued)

The volume of each box is shown. Find the missing edge, in centimeters.

7

V = 216 cm³

4

x

9

_____ cm

8

V = 378 cm³

6

x

7

_____ cm

9

V = 240 cm³

8

10

x

_____ cm

10

V = 144 cm³

x

9

4

_____ cm

34. Circles of a right triangle

Each circle passes through all three corners. Find its radius.

11

20

24

26

?

_____ cm

12

15

20

25

?

_____ cm

13

30

40

50

?

_____ cm

14

12

35

37

?

_____ cm

15

9

40

41

?

_____ cm

16

7

24

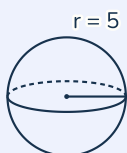
25

?

_____ cm

Surface Area of a Sphere

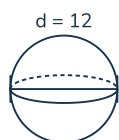
WORKED EXAMPLE

**314** cm^2

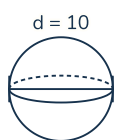
35. Surface area of a sphere

Find the surface area of each sphere. Use $\pi = 3.14$.

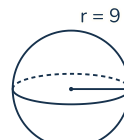
1

_____ cm^2

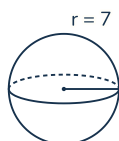
2

_____ cm^2

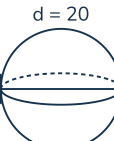
3

_____ cm^2

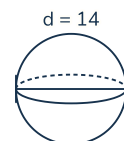
4

_____ cm^2

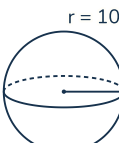
5

_____ cm^2

6

_____ cm^2

7

_____ cm^2

8

_____ cm^2

9

_____ cm^2

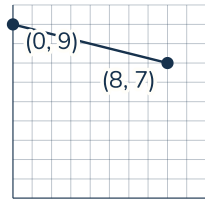
10

_____ cm^2

36. Midpoint of a segment

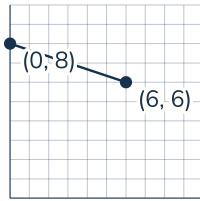
Find the midpoint of each segment.

11



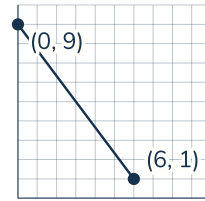
(_____ , _____)

12



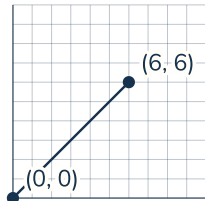
(_____ , _____)

13



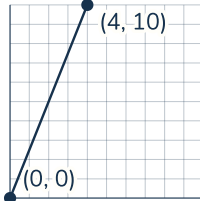
(_____ , _____)

14



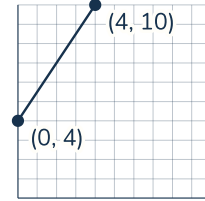
(_____ , _____)

15



(_____ , _____)

16



(_____ , _____)

Answer Key (1 of 5)

Angle Pairs

Angles on a line and around a point

1. 180° (55° , 50° , x): 75°
2. 180° (45° , x , 95°): 40°
3. 180° (x , 45° , 70°): 65°
4. 180° (55° , 35° , x): 90°
5. 180° (x , 35° , 40°): 105°
6. 180° (65° , x , 50°): 65°
7. 180° (70° , 55° , x): 55°
8. 180° (x , 85° , 35°): 60°
9. 180° (x , 75° , 45°): 60°
10. 180° (x , 55° , 45°): 80°
11. 180° (50° , x , 70°): 60°
12. 180° (x , 45° , 50°): 85°

Exterior Angles

The exterior angle of a triangle

1. $25^\circ + 115^\circ$: 140°
2. $55^\circ + 85^\circ$: 140°
3. $40^\circ + 55^\circ$: 95°
4. $25^\circ + 85^\circ$: 110°
5. $70^\circ + 80^\circ$: 150°
6. $50^\circ + 105^\circ$: 155°
7. $50^\circ + 100^\circ$: 150°
8. $45^\circ + 105^\circ$: 150°
9. $45^\circ + 50^\circ$: 95°
10. $75^\circ + 75^\circ$: 150°
11. $30^\circ + 110^\circ$: 140°
12. $35^\circ + 60^\circ$: 95°

Angles in Polygons

Angles inside a polygon

1. 8-sided, all the angles: 1080°
2. 4-sided, all the angles: 360°
3. 10-sided, all the angles: 1440°
4. 5-sided, all the angles: 540°
5. 6-sided, all the angles: 720°
6. 9-sided, all the angles: 1260°
7. 3-sided, all the angles: 180°
8. regular 9-sided, each angle: 140°

The Triangle Inequality

Can these be the sides of a triangle?

1. 6, 10, 11: Yes
2. 4, 6, 12: No
3. 7, 8, 9: Yes
4. 11, 16, 16: Yes

The Triangle Inequality (continued)

Can these be the sides of a triangle? (continued)

5. 9, 10, 11: Yes
6. 3, 11, 16: No
7. 3, 9, 11: Yes
8. 14, 14, 14: Yes
9. 10, 11, 13: Yes
10. 3, 15, 15: Yes
11. 13, 13, 13: Yes
12. 8, 13, 16: Yes

Angles on a line and around a point

13. 180° (55° , 50° , x): 75°
14. 180° (70° , x , 50°): 60°
15. 180° (x , 50° , 60°): 70°
16. 180° (40° , x , 100°): 40°
17. 180° (35° , 70° , x): 75°
18. 180° (35° , 55° , x): 90°

Isosceles Triangles

Angles in an isosceles triangle

1. apex 90° : 45°
2. base 70° : 40°
3. apex 60° : 60°
4. apex 40° : 70°
5. base 75° : 30°
6. apex 80° : 50°
7. base 30° : 120°
8. apex 120° : 30°
9. apex 100° : 40°
10. base 50° : 80°

The exterior angle of a triangle

11. $55^\circ + 75^\circ$: 130°
12. $40^\circ + 55^\circ$: 95°
13. $50^\circ + 90^\circ$: 140°
14. $50^\circ + 60^\circ$: 110°
15. $45^\circ + 55^\circ$: 100°
16. $30^\circ + 45^\circ$: 75°

Midsegments

The midsegment of a triangle

1. base 28: 14 cm
2. midsegment 17: 34 cm
3. base 20: 10 cm
4. base 6: 3 cm
5. midsegment 10: 20 cm
6. base 14: 7 cm
7. base 10: 5 cm

Answer Key (2 of 5)

Midsegments (continued)

The midsegment of a triangle (continued)

8. midsegment 20: 40 cm
9. base 18: 9 cm
10. base 32: 16 cm

Angles inside a polygon

11. 3-sided, all the angles: 180°
12. 10-sided, all the angles: 1440°
13. 4-sided, all the angles: 360°
14. 6-sided, all the angles: 720°
15. regular 10-sided, each angle: 144°
16. 7-sided, all the angles: 900°

Congruence Criteria

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

1. marked 3 sides: SSS
2. marked a right angle, 2 sides: HL
3. marked 2 sides, 1 angle: SAS
4. marked 3 sides: SSS
5. marked 1 side, 2 angles: AAS
6. marked 2 sides, 1 angle: SAS
7. marked a right angle, 2 sides: HL
8. marked 3 sides: SSS
9. marked 1 side, 2 angles: ASA
10. marked 3 sides: SSS

Can these be the sides of a triangle?

11. 11, 12, 13: Yes
12. 6, 8, 12: Yes
13. 10, 11, 13: Yes
14. 9, 12, 12: Yes
15. 4, 4, 8: No
16. 9, 12, 14: Yes

Proofs with Triangles

Complete the triangle congruence proof

1. $\triangle ABC \cong \triangle ADC$ ($AB \cong AD$, $CB \cong CD$), step 3: Reflexive Property
2. $\triangle PQR \cong \triangle STU$ ($\angle P \cong \angle S$, $PQ \cong ST$, $\angle Q \cong \angle T$), step 4: ASA
3. $\triangle RSV \cong \triangle TUV$ ($RS \parallel UT$, $RS \cong UT$), step 1: Alternate Interior Angles
4. $\triangle GLH \cong \triangle JKL$ ($GL \cong JL$, $HL \cong KL$), step 2: Vertical Angles

Proofs with Similar Triangles

Complete the similar-triangle proof

1. $\triangle RUV \sim \triangle RST$ ($RU/RS = RV/RT$), step 1: Reflexive Property

Proofs with Similar Triangles (continued)

Complete the similar-triangle proof (continued)

2. $\triangle SPR \sim \triangle PQR$ ($\angle QPR$ is a right angle, $PS \perp QR$), step 3: AA ~
3. $\triangle GHL \sim \triangle JKL$ ($\angle GHL \cong \angle JKL$), step 1: Given
4. $\triangle ADE \sim \triangle ABC$ ($\angle ADE \cong \angle B$), step 2: Given

Writing a Proof

Write a triangle proof

1. $\triangle GHJ \cong \triangle KLM$ — 1. $GH \cong KL$ — Given; 2. $\angle G \cong \angle K$ — Given; 3. $GJ \cong KM$ — Given; 4. $\triangle GHJ \cong \triangle KLM$ — SAS
2. $\triangle GHJ \cong \triangle KLM$ — 1. $\angle G \cong \angle K$ — Given; 2. $GH \cong KL$ — Given; 3. $\angle H \cong \angle L$ — Given; 4. $\triangle GHJ \cong \triangle KLM$ — ASA
3. $\triangle GLH \cong \triangle JKL$ — 1. $HL \cong KL$ — Definition of Midpoint; 2. $\angle GLH \cong \angle JKL$ — Vertical Angles; 3. $GL \cong JL$ — Given; 4. $\triangle GLH \cong \triangle JKL$ — SAS
4. $\triangle GHJ \cong \triangle KLM$ — 1. $\angle H \cong \angle L$ — Given; 2. $GJ \cong KM$ — Given; 3. $GH \cong KL$ — Given; 4. $\triangle GHJ \cong \triangle KLM$ — HL

Similar Figures

Similar figures and scale

1. 8 by 4 and 24 by x: 12
2. 4 by x and 8 by 4: 2
3. 12 by 7 and 24 by x: 14
4. 7 by x and 21 by 6: 2
5. 8 by 6 and 16 by x: 12
6. 10 by x and 20 by 14: 7
7. 9 by 5 and 18 by x: 10
8. 6 by x and 18 by 9: 3
9. 11 by x and 22 by 16: 8
10. 6 by 5 and 18 by x: 15

Angles in an isosceles triangle

11. apex 30° : 75°
12. base 50° : 80°
13. apex 50° : 65°
14. base 75° : 30°
15. apex 90° : 45°
16. base 60° : 60°

Right Triangle Trigonometry

Right-triangle trigonometry

1. 55° , opp 17 $\rightarrow$ adj $x = 11.9$
2. 60° , opp 6 $\rightarrow$ adj $x = 3.5$
3. 40° , adj 12 $\rightarrow$ opp $x = 10.1$
4. 20° , adj 15 $\rightarrow$ hyp $x = 16$
5. 50° , adj 15 $\rightarrow$ opp $x = 17.9$
6. 25° , hyp 19 $\rightarrow$ opp $x = 8$
7. 55° , hyp 15 $\rightarrow$ opp $x = 12.3$

Answer Key (3 of 5)

Right Triangle Trigonometry (continued)

Right-triangle trigonometry (continued)

8. 70° , adj 5 $\rightarrow$ opp $x = 13.7$
9. 30° , hyp 6 $\rightarrow$ adj $x = 5.2$
10. 35° , adj 13 $\rightarrow$ opp $x = 9.1$

The midsegment of a triangle

11. base 24: 12 cm
12. midsegment 10: 20 cm
13. base 20: 10 cm
14. midsegment 12: 24 cm
15. base 18: 9 cm
16. base 10: 5 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) = $3/5$
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. $\sin A$ (legs 12, 35, hyp 37) = $12/37$
9. $\tan A$ (legs 12, 35, hyp 37) = $12/35$
10. $\cos A$ (legs 8, 15, hyp 17) = $15/17$

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. 6 by 5 and 12 by x : 10
10. 8 by x and 16 by 8: 4
11. 12 by 3 and 24 by x : 6

The Laws of Sines and Cosines (continued)

Similar figures and scale (continued)

12. 6 by x and 24 by 8: 2
13. 12 by x and 24 by 10: 5
14. 11 by 2 and 22 by x : 4

Parts of a Circle

Arc length and sector area

1. $r = 7$, 180° , arc: 21.98 cm
2. $r = 3$, 30° , arc: 1.57 cm
3. $r = 8$, 180° , area: 100.48 cm^2
4. $r = 3$, 270° , arc: 14.13 cm
5. $r = 2$, 45° , arc: 1.57 cm
6. $r = 2$, 180° , area: 6.28 cm^2

Right-triangle trigonometry

7. 35° , opp 13 $\rightarrow$ hyp $x = 22.7$
8. 30° , adj 9 $\rightarrow$ opp $x = 5.2$
9. 70° , opp 19 $\rightarrow$ hyp $x = 20.2$
10. 55° , adj 12 $\rightarrow$ hyp $x = 20.9$
11. 30° , hyp 6 $\rightarrow$ adj $x = 5.2$
12. 55° , hyp 20 $\rightarrow$ opp $x = 16.4$

Inscribed Angles

Inscribed angle in a circle

1. center $60^\circ \rightarrow$ circle 30°
2. center $100^\circ \rightarrow$ circle 50°
3. center $170^\circ \rightarrow$ circle 85°
4. center $40^\circ \rightarrow$ circle 20°
5. center $90^\circ \rightarrow$ circle 45°
6. center $160^\circ \rightarrow$ circle 80°
7. center $80^\circ \rightarrow$ circle 40°
8. center $110^\circ \rightarrow$ circle 55°
9. center $140^\circ \rightarrow$ circle 70°
10. center $30^\circ \rightarrow$ circle 15°

Write a trigonometric ratio

11. $\sin B$ (legs 24, 7, hyp 25) = $24/25$
12. $\tan B$ (legs 12, 5, hyp 13) = $12/5$
13. $\sin B$ (legs 35, 12, hyp 37) = $35/37$
14. $\tan A$ (legs 3, 4, hyp 5) = $3/4$
15. $\cos B$ (legs 15, 8, hyp 17) = $8/17$
16. $\tan A$ (legs 7, 24, hyp 25) = $7/24$

Triangles and Circles

Circles of a right triangle

1. 9, 12, 15 — through the corners: 7.5 cm
2. 10, 24, 26 — through the corners: 13 cm
3. 24, 45, 51 — through the corners: 25.5 cm

Answer Key (4 of 5)

Triangles and Circles (continued)

Circles of a right triangle (continued)

- 12, 16, 20 — through the corners: 10 cm
- 21, 28, 35 — through the corners: 17.5 cm
- 27, 36, 45 — through the corners: 22.5 cm
- 12, 35, 37 — through the corners: 18.5 cm
- 6, 8, 10 — through the corners: 5 cm
- 9, 40, 41 — through the corners: 20.5 cm
- 24, 32, 40 — through the corners: 20 cm

Laws of sines and cosines

- In $\triangle ABC$, $a = 6$, $\angle A = 60^\circ$, $\angle B = 45^\circ$. Find b : 4.9
- In $\triangle ABC$, $a = 9$, $\angle A = 45^\circ$, $\angle B = 55^\circ$. Find b : 10.4
- In $\triangle ABC$, $a = 7$, $\angle A = 40^\circ$, $\angle B = 60^\circ$. Find b : 9.4
- In $\triangle ABC$, $a = 10$, $\angle A = 50^\circ$, $\angle B = 70^\circ$. Find b : 12.3
- In $\triangle ABC$, $a = 12$, $\angle A = 40^\circ$, $\angle B = 50^\circ$. Find b : 14.3
- In $\triangle ABC$, $a = 9$, $\angle A = 65^\circ$, $\angle B = 40^\circ$. Find b : 6.4

Midpoints

Midpoint of a segment

- (0, 4) and (4, 8): (2, 6)
- (0, 0) and (4, 6): (2, 3)
- (0, 0) and (10, 10): (5, 5)
- (0, 7) and (4, 1): (2, 4)
- (0, 1) and (6, 3): (3, 2)
- (0, 8) and (8, 0): (4, 4)
- (0, 10) and (6, 6): (3, 8)
- (0, 4) and (10, 0): (5, 2)
- (0, 6) and (2, 0): (1, 3)
- (0, 2) and (6, 10): (3, 6)
- (0, 1) and (8, 3): (4, 2)
- (0, 4) and (10, 8): (5, 6)

Arc length and sector area

- $r = 8$, 270° , arc: 37.68 cm
- $r = 2$, 45° , area: 1.57 cm^2
- $r = 10$, 180° , area: 157 cm^2
- $r = 6$, 180° , area: 56.52 cm^2
- $r = 8$, 90° , arc: 12.56 cm
- $r = 12$, 135° , arc: 28.26 cm

Parts of a Solid

Faces, edges and vertices

- cuboid, edges: 12
- pentagonal prism, faces: 7
- triangular prism, faces (from the other two): 5
- hexagonal prism, vertices: 12
- triangular prism, faces: 5
- pentagonal pyramid, faces (from the other two): 6

Parts of a Solid (continued)

Inscribed angle in a circle

- center $130^\circ \rightarrow$ circle 65°
- center $40^\circ \rightarrow$ circle 20°
- center $160^\circ \rightarrow$ circle 80°
- center $120^\circ \rightarrow$ circle 60°
- center $30^\circ \rightarrow$ circle 15°
- center $140^\circ \rightarrow$ circle 70°

Missing Edges

Missing edge from the volume

- $V 220: x \times 2 \times 11 \rightarrow x = 10$
- $V 84: 2 \times x \times 7 \rightarrow x = 6$
- $V 396: 4 \times 9 \times x \rightarrow x = 11$
- $V 144: 8 \times x \times 6 \rightarrow x = 3$
- $V 360: 12 \times 10 \times x \rightarrow x = 3$
- $V 72: x \times 2 \times 9 \rightarrow x = 4$
- $V 216: x \times 4 \times 9 \rightarrow x = 6$
- $V 378: x \times 6 \times 7 \rightarrow x = 9$
- $V 240: 10 \times 8 \times x \rightarrow x = 3$
- $V 144: 9 \times x \times 4 \rightarrow x = 4$

Circles of a right triangle

- 10, 24, 26 — through the corners: 13 cm
- 15, 20, 25 — through the corners: 12.5 cm
- 30, 40, 50 — through the corners: 25 cm
- 12, 35, 37 — through the corners: 18.5 cm
- 9, 40, 41 — through the corners: 20.5 cm
- 7, 24, 25 — through the corners: 12.5 cm

Surface Area of a Sphere

Surface area of a sphere

- $d = 12$: 452.16 cm^2
- $d = 10$: 314 cm^2
- $r = 9$: 1017.36 cm^2
- $r = 7$: 615.44 cm^2
- $d = 20$: 1256 cm^2
- $d = 14$: 615.44 cm^2
- $r = 10$: 1256 cm^2
- $r = 3$: 113.04 cm^2
- $d = 18$: 1017.36 cm^2
- $r = 8$: 803.84 cm^2

Midpoint of a segment

- (0, 9) and (8, 7): (4, 8)
- (0, 8) and (6, 6): (3, 7)
- (0, 9) and (6, 1): (3, 5)
- (0, 0) and (6, 6): (3, 3)
- (0, 0) and (4, 10): (2, 5)

Answer Key (5 of 5)

Surface Area of a Sphere (continued)

Midpoint of a segment (continued)

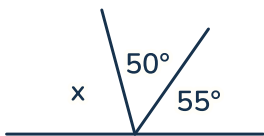
16. $(0, 4)$ and $(4, 10)$: $(2, 7)$

Solutions (1 of 25)

Angle Pairs

Angles on a line and around a point

1.



— degrees

$$55^\circ + 50^\circ + x = 180^\circ$$

$$55^\circ + 50^\circ = 105^\circ$$

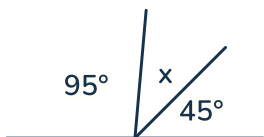
$$180^\circ - 105^\circ = 75^\circ$$

The angles on a straight line add up to 180° , so all three together make 180° .

Add the two you are given first: $55 + 50 = 105$.

Then take that from 180° : $180 - 105 = 75$. So $x = 75^\circ$.

2.



— degrees

$$45^\circ + 95^\circ + x = 180^\circ$$

$$45^\circ + 95^\circ = 140^\circ$$

$$180^\circ - 140^\circ = 40^\circ$$

The angles on a straight line add up to 180° , so all three together make 180° .

Add the two you are given first: $45 + 95 = 140$.

Then take that from 180° : $180 - 140 = 40$. So $x = 40^\circ$.

Solutions (2 of 25)

Exterior Angles

The exterior angle of a triangle

1.



_____ degrees

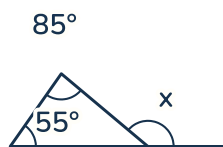
$$\begin{aligned}x &= 25^\circ + 115^\circ \\25^\circ + 115^\circ &= 140^\circ \\x &= 140^\circ\end{aligned}$$

An exterior angle of a triangle equals the sum of the two remote interior angles — the two it does not sit against. Here those are 25° and 115° .

Add them: $25 + 115 = 140$.

So $x = 140^\circ$.

2.



_____ degrees

$$\begin{aligned}x &= 55^\circ + 85^\circ \\55^\circ + 85^\circ &= 140^\circ \\x &= 140^\circ\end{aligned}$$

An exterior angle of a triangle equals the sum of the two remote interior angles — the two it does not sit against. Here those are 55° and 85° .

Add them: $55 + 85 = 140$.

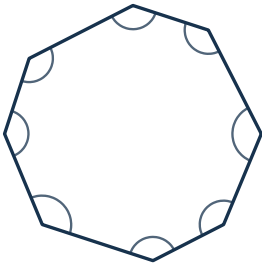
So $x = 140^\circ$.

Solutions (3 of 25)

Angles in Polygons

Angles inside a polygon

1.



All the angles together

_____ degrees

1080°

There is no separate rule for each shape. Pick one corner of the octagon and draw a line from it to every corner it is not already joined to — the whole shape falls into triangles, and you already know what a triangle's angles come to.

Counting them: the corner you started from reaches every other corner except its own two neighbors, so an 8-sided shape splits into $8 - 2 = 6$ triangles.

Every triangle's angles add to 180° , and between them the triangles use up every angle of the shape and nothing else. So the whole lot comes to $6 \times 180 = 1080^\circ$.

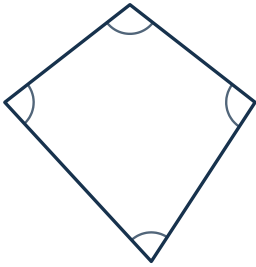
So the angles of an octagon add up to 1080° .

Solutions (4 of 25)

Angles in Polygons (continued)

Angles inside a polygon (continued)

2.



All the angles together

_____ degrees

360°

There is no separate rule for each shape. Pick one corner of the quadrilateral and draw a line from it to every corner it is not already joined to — the whole shape falls into triangles, and you already know what a triangle's angles come to.

Counting them: the corner you started from reaches every other corner except its own two neighbors, so a 4-sided shape splits into $4 - 2 = 2$ triangles.

Every triangle's angles add to 180° , and between them the triangles use up every angle of the shape and nothing else. So the whole lot comes to $2 \times 180 = 360^\circ$.

So the angles of a quadrilateral add up to 360° .

The Triangle Inequality

Can these be the sides of a triangle?

1.

_____ 6

_____ 10

_____ 11

Yes

No

Yes

Three lengths make a triangle only when the two shorter sides add to more than the longest. The two shorter are 6 and 10; the longest is 11.

$6 + 10 = 16$, which is more than 11.

The two shorter sides reach past the longest, so they close into a triangle. Yes.

Solutions (5 of 25)

The Triangle Inequality (continued)

Can these be the sides of a triangle? (continued)

2.

— 4

— 6

— 12

Yes

No

No

Three lengths make a triangle only when the two shorter sides add to more than the longest. The two shorter are 4 and 6; the longest is 12.

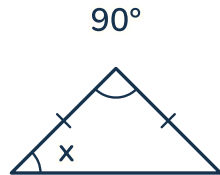
$4 + 6 = 10$, which is less than 12.

The two shorter sides do not reach past the longest, so they cannot close. No.

Isosceles Triangles

Angles in an isosceles triangle

1.



— degrees

base = base and

sum = 180°

90 ÷ 2 = 45

x = 45°

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 (6 of 25)

Isosceles Triangles (continued)

Angles in an isosceles triangle (continued)

2.



— degrees

base = base and

sum = 180°

$180 - 140 = 40$

$x = 40^\circ$

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

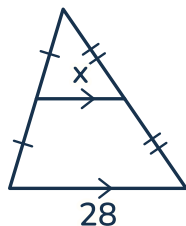
Both base angles are 70° , so together they are 140° . The apex is what is left of 180° : $180 - 140 = 40$.

So $x = 40^\circ$.

Midsegments

The midsegment of a triangle

1.



— cm

midsegment =

half the base

$28 \div 2 = 14$

$x = 14 \text{ cm}$

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 28 cm, so the midsegment is half of it: $28 \div 2 = 14$.

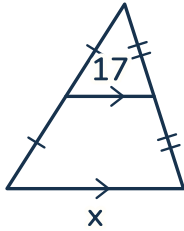
So $x = 14 \text{ cm}$.

Solutions (7 of 25)

Midsegments (continued)

The midsegment of a triangle (continued)

2.



— cm

midsegment =

half the base

$$17 \times 2 = 34$$

$$x = 34 \text{ cm}$$

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.

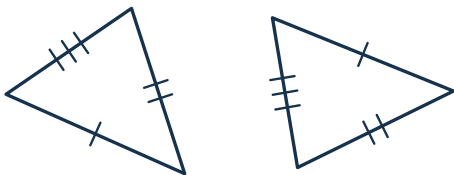
The midsegment is 17 cm, so the base is twice it: $17 \times 2 = 34$.

So $x = 34$ cm.

Congruence Criteria

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

1.



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.

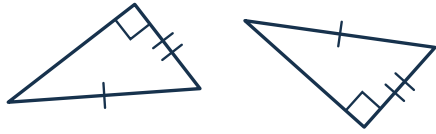
So the rule is SSS.

Solutions (8 of 25)

Congruence Criteria (continued)

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

2.



SSS

SAS

ASA

AAS

HL

HL

Read the marks first — they are the givens. Here there are a right angle in each, and the hypotenuse with one leg marked equal.

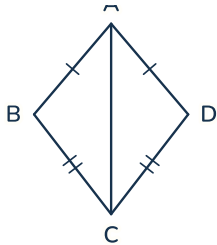
In a right triangle the hypotenuse and one leg give the other leg by Pythagoras, so the two triangles have to match.

So the rule is HL.

Proofs with Triangles

Complete the triangle congruence proof

1.



Given $AB \cong AD$; $CB \cong CD$

Prove $\triangle ABC \cong \triangle ADC$

Statements

Reasons

1. $AB \cong AD$

Given

2. $CB \cong CD$

Given

3. $AC \cong AC$

?

4. $\triangle ABC \cong \triangle ADC$

SSS

Reason for step 3:

Given

Reflexive Property

Vertical Angles

Alternate Interior Angles

Definition of Midpoint

SSS

SAS

ASA

AAS

HL

Definition of Perpendicular

Step 3: $AC \cong AC$

$AC \cong AC \rightarrow$

Reflexive Property

Reflexive Property

The proof is missing the reason for step 3: " $AC \cong AC$ ". Read what that step claims.

A segment (or angle) is congruent to itself. The two triangles share this side, so it is equal in both by the reflexive property.

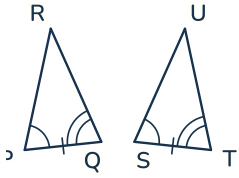
So the missing reason is Reflexive Property.

Solutions (9 of 25)

Proofs with Triangles (continued)

Complete the triangle congruence proof (continued)

2.



Given $\angle P \cong \angle S$; $PQ \cong ST$; $\angle Q \cong \angle T$

Prove $\triangle PQR \cong \triangle STU$

Statements	Reasons
1. $\angle P \cong \angle S$	Given
2. $PQ \cong ST$	Given
3. $\angle Q \cong \angle T$	Given
4. $\triangle PQR \cong \triangle STU$	?

Reason for step 4:

Given

Reflexive Property

Vertical Angles

Alternate Interior Angles

Definition of Midpoint

SSS

SAS

ASA

AAS

HL

Definition of Perpendicular

Step 4: $\triangle PQR \cong \triangle STU$

$\triangle PQR \cong \triangle STU \rightarrow$ **ASA**

ASA

The proof is missing the reason for step 4: " $\triangle PQR \cong \triangle STU$ ". Read what that step claims.

Two pairs of angles and the side between them are equal: ASA.

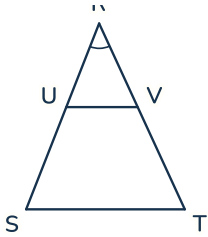
So the missing reason is ASA.

Solutions (10 of 25)

Proofs with Similar Triangles

Complete the similar-triangle proof

1.



Given $RU/RS = RV/RT$

Prove $\triangle RUV \sim \triangle RST$

Statements

Reasons

1. $\angle R \cong \angle R$

?

2. $RU/RS = RV/RT$

Given

3. $\triangle RUV \sim \triangle RST$

SAS ~

Reason for step 1:

Given

Reflexive Property

Vertical Angles

Corresponding Angles

Alternate Interior Angles

AA ~

SAS ~

SSS ~

Step 1: $\angle R \cong \angle R$

$\angle R \cong \angle R \rightarrow$

Reflexive Property

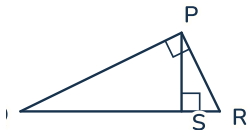
Reflexive Property

The proof is missing the reason for step 1: " $\angle R \cong \angle R$ ". Read what that step claims.

A segment (or angle) is congruent to itself. The two triangles share this side, so it is equal in both by the reflexive property.

So the missing reason is Reflexive Property.

2.



Given $\angle QPR$ is a right angle; $PS \perp QR$

Prove $\triangle SPR \sim \triangle PQR$

Statements

Reasons

1. $\angle R \cong \angle R$

Reflexive Property

2. $\angle PSR \cong \angle QPR$

Right angles are congruent

3. $\triangle SPR \sim \triangle PQR$

?

Reason for step 3:

Given

Reflexive Property

Vertical Angles

Corresponding Angles

Alternate Interior Angles

AA ~

SAS ~

SSS ~

Step 3: $\triangle SPR \sim \triangle PQR$

$\triangle SPR \sim \triangle PQR \rightarrow$ AA ~

AA ~

The proof is missing the reason for step 3: " $\triangle SPR \sim \triangle PQR$ ". Read what that step claims.

Two pairs of angles are congruent, and two angles are enough to make triangles similar: AA.

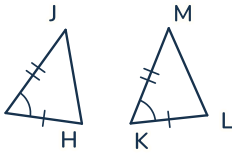
So the missing reason is AA ~.

Solutions (11 of 25)

Writing a Proof

Write a triangle proof

1.



Given $GH \cong KL$; $\angle G \cong \angle K$; $GJ \cong KM$

Prove $\triangle GHJ \cong \triangle KLM$

Statements

Reasons

1.

2.

3.

4.

Prove: $\triangle GHJ \cong \triangle KLM$

1. $GH \cong KL \rightarrow$ **Given**

2. $\angle G \cong \angle K \rightarrow$ **Given**

3. $GJ \cong KM \rightarrow$ **Given**

4. $\triangle GHJ \cong \triangle KLM \rightarrow$ **SAS**

You are given $GH \cong KL$; $\angle G \cong \angle K$; $GJ \cong KM$, and you have to prove $\triangle GHJ \cong \triangle KLM$. Build it one line at a time — each line is a statement and the reason it is true.

1. $GH \cong KL$ — This fact is handed to you in the Given — nothing has to justify it.

2. $\angle G \cong \angle K$ — This fact is handed to you in the Given — nothing has to justify it.

3. $GJ \cong KM$ — This fact is handed to you in the Given — nothing has to justify it.

4. $\triangle GHJ \cong \triangle KLM$ — Two pairs of sides and the angle between them are equal: SAS.

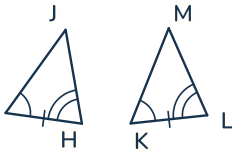
That is the whole proof: the last line, $\triangle GHJ \cong \triangle KLM$, follows by SAS.

Solutions (12 of 25)

Writing a Proof (continued)

Write a triangle proof (continued)

2.



Given $\angle G \cong \angle K$; $GH \cong KL$; $\angle H \cong \angle L$

Prove $\triangle GHJ \cong \triangle KLM$

Statements

Reasons

1.

2.

3.

4.

Prove: **$\triangle GHJ \cong \triangle KLM$**

1. $\angle G \cong \angle K \rightarrow$ **Given**

2. $GH \cong KL \rightarrow$ **Given**

3. $\angle H \cong \angle L \rightarrow$ **Given**

4. $\triangle GHJ \cong \triangle KLM \rightarrow$ **ASA**

You are given $\angle G \cong \angle K$; $GH \cong KL$; $\angle H \cong \angle L$, and you have to prove $\triangle GHJ \cong \triangle KLM$. Build it one line at a time — each line is a statement and the reason it is true.

1. $\angle G \cong \angle K$ — This fact is handed to you in the Given — nothing has to justify it.

2. $GH \cong KL$ — This fact is handed to you in the Given — nothing has to justify it.

3. $\angle H \cong \angle L$ — This fact is handed to you in the Given — nothing has to justify it.

4. $\triangle GHJ \cong \triangle KLM$ — Two pairs of angles and the side between them are equal: ASA.

That is the whole proof: the last line, $\triangle GHJ \cong \triangle KLM$, follows by ASA.

Solutions (13 of 25)

Similar Figures

Similar figures and scale

1.



— cm

12 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. 8 became 24, and $24 \div 8 = 3$ — so every side is 3 times bigger.

Now the missing side is on the BIG shape, so it grows: $4 \times 3 = 12$.

Check it against the picture: the answer should be bigger than 4, and 12 is. So the missing side is 12 cm.

2.



— cm

2 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. 4 became 8, and $8 \div 4 = 2$ — so every side is 2 times bigger.

Now the missing side is on the SMALL shape, so it shrinks — divide instead of multiply: $4 \div 2 = 2$.

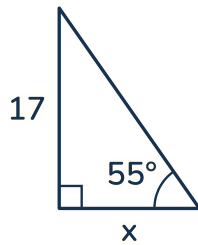
Check it against the picture: the answer should be smaller than 4, and 2 is. So the missing side is 2 cm.

Solutions (14 of 25)

Right Triangle Trigonometry

Right-triangle trigonometry

1.



_____ cm

opposite ÷ adjacent =

tangent

$$\tan 55^\circ = 17 \div x$$

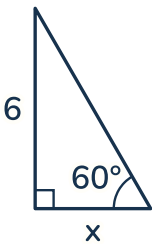
$$x = 11.9$$

The angle is 55°. You know the opposite (17) 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: $\tan 55^\circ = 17 \div x$.

Rearrange for x and work it out on a calculator: $x = 17 \div \tan 55^\circ = 11.9$.

2.



_____ cm

opposite ÷ adjacent =

tangent

$$\tan 60^\circ = 6 \div x$$

$$x = 3.5$$

The angle is 60°. You know the opposite (6) 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: $\tan 60^\circ = 6 \div x$.

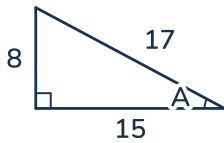
Rearrange for x and work it out on a calculator: $x = 6 \div \tan 60^\circ = 3.5$.

Solutions (15 of 25)

Trigonometric Ratios

Write a trigonometric ratio

1.



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

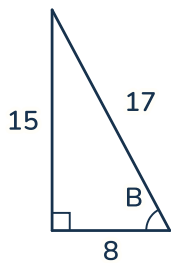
$$\sin A = \frac{8}{17}$$

$\sin A$ 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 $\tan B = 15/8$.

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 : $\underline{\hspace{2cm}}$

$$\begin{aligned} b &= \frac{a \cdot \sin B}{\sin A} \\ b &= \frac{6 \cdot \sin 45^\circ}{\sin 60^\circ} \\ b &\approx 4.9 \end{aligned}$$

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: $b \approx 4.9$.

Solutions (16 of 25)

The Laws of Sines and Cosines (continued)

Laws of sines and cosines (continued)

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: $a/\sin A = b/\sin B$.

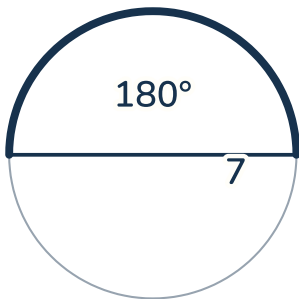
Substitute $a = 9$, $A = 45^\circ$, $B = 55^\circ$.

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

Parts of a Circle

Arc length and sector area

1.



Length of the curved edge

_____ cm

$$180/360 = 1/2$$

$$2 \times 3.14 \times 7 = 43.96$$

$$1/2 \text{ of } 43.96 = 21.98$$

$$21.98 \text{ cm}$$

A slice is a FRACTION of the whole circle, and the angle says which fraction. A full turn is 360° , so 180° is 180 out of 360 — that is $1/2$ of the circle. Write that down before touching a formula.

Now the whole circle, as if there were no slice. All the way round is $2 \times \pi \times r$: $2 \times 3.14 \times 7 = 43.96$ cm.

Then take the slice's share of it: $1/2$ of 43.96 is 21.98.

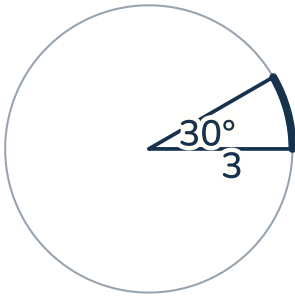
So the curved edge is 21.98 cm. Check the unit against what was asked — a curved edge is a length and a slice is an area, and getting cm where you expected the other one means you answered the other question.

Solutions (17 of 25)

Parts of a Circle (continued)

Arc length and sector area (continued)

2.



Length of the curved edge

_____ cm

$$30/360 = \frac{1}{12}$$

$$2 \times 3.14 \times 3 = 18.84$$

$$\frac{1}{12} \text{ of } 18.84 = 1.57 \text{ cm}$$

A slice is a FRACTION of the whole circle, and the angle says which fraction. A full turn is 360° , so 30° is 30 out of 360 — that is $1/12$ of the circle. Write that down before touching a formula.

Now the whole circle, as if there were no slice. All the way round is $2 \times \pi \times r$: $2 \times 3.14 \times 3 = 18.84$ cm.

Then take the slice's share of it: $1/12$ of 18.84 is 1.57.

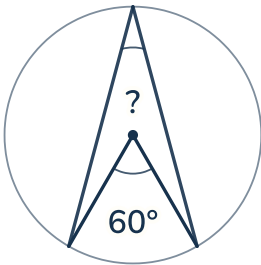
So the curved edge is 1.57 cm. Check the unit against what was asked — a curved edge is a length and a slice is an area, and getting cm where you expected the other one means you answered the other question.

Solutions (18 of 25)

Inscribed Angles

Inscribed angle in a circle

1.



— degrees

same arc, two angles

center = $2 \times$ circle so

circle = center $\div$ 2

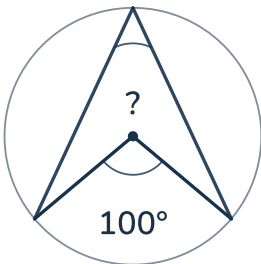
$$60 \div 2 = 30$$

Both marked angles stand on the SAME arc — the two chords and the two radii end at the same two points on the circle. That is what makes them a pair; two angles in a circle that do not share an arc have nothing to say to each other.

The angle at the CENTER is always twice the one on the circle, wherever on the far arc that point sits. Here the center angle is the one given, so this is a halving.

Half of 60 is 30, so the angle on the circle is 30° .

2.



— degrees

same arc, two angles

center = $2 \times$ circle so

circle = center $\div$ 2

$$100 \div 2 = 50$$

Both marked angles stand on the SAME arc — the two chords and the two radii end at the same two points on the circle. That is what makes them a pair; two angles in a circle that do not share an arc have nothing to say to each other.

The angle at the CENTER is always twice the one on the circle, wherever on the far arc that point sits. Here the center angle is the one given, so this is a halving.

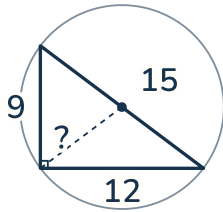
Half of 100 is 50, so the angle on the circle is 50° .

Solutions (19 of 25)

Triangles and Circles

Circles of a right triangle

1.



— cm

right angle on the circle →

180° at the center

the 15 cm side =

the diameter

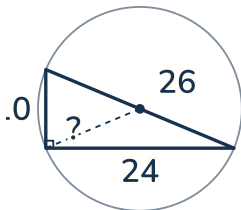
$$15 \div 2 = \mathbf{7.5}$$

The corner between the two short sides is a RIGHT angle, and it is sitting on the circle looking straight across at the hypotenuse. An angle on a circle is half the one at the center, so the angle at the center here is 180° — a straight line.

A straight line through the center IS a diameter. So the hypotenuse is the diameter, and the center of the circle is its midpoint — not somewhere inside the triangle.

The radius is half the diameter: $15 \div 2 = 7.5$. So the circle through all three corners has a radius of 7.5 cm, and the two short sides never come into it.

2.



— cm

right angle on the circle →

180° at the center

the 26 cm side =

the diameter

$$26 \div 2 = \mathbf{13}$$

The corner between the two short sides is a RIGHT angle, and it is sitting on the circle looking straight across at the hypotenuse. An angle on a circle is half the one at the center, so the angle at the center here is 180° — a straight line.

A straight line through the center IS a diameter. So the hypotenuse is the diameter, and the center of the circle is its midpoint — not somewhere inside the triangle.

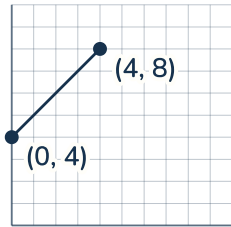
The radius is half the diameter: $26 \div 2 = 13$. So the circle through all three corners has a radius of 13 cm, and the two short sides never come into it.

Solutions (20 of 25)

Midpoints

Midpoint of a segment

1.

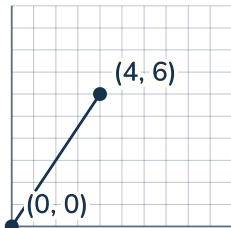


(—, —)

$$\begin{aligned}(0 + 4) \div 2 &= 2 \\ (4 + 8) \div 2 &= 6 \\ &\mathbf{(2, 6)}\end{aligned}$$

The midpoint is halfway between, so average each coordinate on its own. The x's first: $(0 + 4) \div 2 = 2$.
Now the y's the same way: $(4 + 8) \div 2 = 6$.
So the midpoint is $(2, 6)$.

2.



(—, —)

$$\begin{aligned}(0 + 4) \div 2 &= 2 \\ (0 + 6) \div 2 &= 3 \\ &\mathbf{(2, 3)}\end{aligned}$$

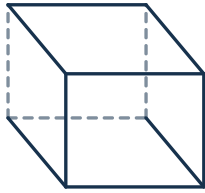
The midpoint is halfway between, so average each coordinate on its own. The x's first: $(0 + 4) \div 2 = 2$.
Now the y's the same way: $(0 + 6) \div 2 = 3$.
So the midpoint is $(2, 3)$.

Solutions (21 of 25)

Parts of a Solid

Faces, edges and vertices

1.



How many edges?

—

cuboid

base: square **4 sides**

$$4 + 4 + 4 = \mathbf{12}$$

edges: **12**

Half of a solid is round the back. The dashed lines in the drawing are the parts you cannot see, and they count exactly the same as the ones you can — counting only what faces you is where this goes wrong, every time.

Start by naming the base, because everything else is built on it. A cuboid has a square at the bottom, so the base has 4 sides.

Edges come in three sets: 4 round one end, 4 round the other, and 4 joining the two ends together. Nothing else has an edge, so it is $4 + 4 + 4$.

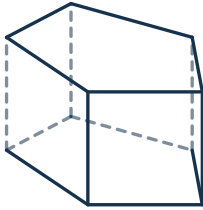
So a cuboid has 12 edges.

Solutions (22 of 25)

Parts of a Solid (continued)

Faces, edges and vertices (continued)

2.



How many faces?

—

pentagonal prism

base: pentagon **5 sides**

$$5 + 2 = \mathbf{7}$$

faces: **7**

Half of a solid is round the back. The dashed lines in the drawing are the parts you cannot see, and they count exactly the same as the ones you can — counting only what faces you are where this goes wrong, every time.

Start by naming the base, because everything else is built on it. A pentagonal prism has a pentagon at the bottom, so the base has 5 sides.

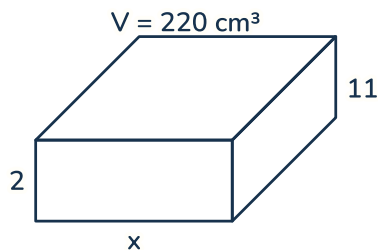
A prism has the same shape at both ends and a flat rectangle down each side of it. That is 5 rectangles round the outside, plus the two ends: $5 + 2$.

So a pentagonal prism has 7 faces.

Missing Edges

Missing edge from the volume

1.



— cm

$$2 \times 11 \times x = \mathbf{220}$$

$$2 \times 11 = \mathbf{22}$$

$$220 \div 22 = \mathbf{10}$$

The volume of a box is its three edges multiplied: length $\times$ width $\times$ height. You have the height (2), the depth (11), and the volume (220).

Multiply the two edges you know first: $2 \times 11 = 22$.

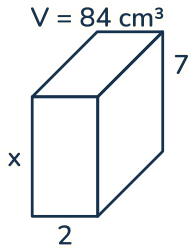
Then the missing edge is the volume divided by that: $220 \div 22 = 10$.

Solutions (23 of 25)

Missing Edges (continued)

Missing edge from the volume (continued)

2.



— cm

$$2 \times 7 \times x = 84$$

$$2 \times 7 = 14$$

$$84 \div 14 = 6$$

The volume of a box is its three edges multiplied: length $\times$ width $\times$ height. You have the width (2), the depth (7), and the volume (84).

Multiply the two edges you know first: $2 \times 7 = 14$.

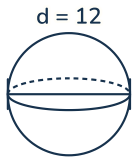
Then the missing edge is the volume divided by that: $84 \div 14 = 6$.

Solutions (24 of 25)

Surface Area of a Sphere

Surface area of a sphere

1.



_____ cm²

diameter: 12 cm

$$12 \div 2 = 6$$

$$6 \times 6 = 36$$

$$12.56 \times 36 = 452.16$$

$$\mathbf{452.16 \text{ cm}^2}$$

The 12 cm marked here goes right ACROSS the sphere — that is the diameter. The formula wants the radius, and using the diameter instead makes the answer FOUR times too big, because it is squared.

Half of 12 is 6, so $r = 6$ cm.

Square the radius on a line of its own. r^2 means $r \times r$, not $r \times 2$: $6 \times 6 = 36$.

Now four times π , times that: 4×3.14 is 12.56, and $12.56 \times 36 = 452.16$. Nothing to round — 12.56 times a whole number always lands on a whole number of hundredths.

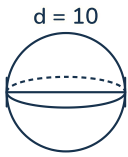
So the surface area is 452.16 square cm. Square, not cubic — a surface is skin rather than space, and the unit is the quickest way to notice you have answered the volume question instead.

Solutions (25 of 25)

Surface Area of a Sphere (continued)

Surface area of a sphere (continued)

2.



_____ cm²

diameter: 10 cm

$$10 \div 2 = 5$$

$$5 \times 5 = 25$$

$$12.56 \times 25 = 314$$

314 cm²

The 10 cm marked here goes right ACROSS the sphere — that is the diameter. The formula wants the radius, and using the diameter instead makes the answer FOUR times too big, because it is squared.

Half of 10 is 5, so $r = 5$ cm.

Square the radius on a line of its own. r^2 means $r \times r$, not $r \times 2$: $5 \times 5 = 25$.

Now four times π , times that: 4×3.14 is 12.56, and $12.56 \times 25 = 314$. Nothing to round — 12.56 times a whole number always lands on a whole number of hundredths.

So the surface area is 314 square cm. Square, not cubic — a surface is skin rather than space, and the unit is the quickest way to notice you have answered the volume question instead.