Secondary educator lesson plan

Mathematics: Bikes and angles

Lesson overview

The class will learn to apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles, and understand and use the relationship between parallel lines and alternate and corresponding angles.

Aim

To teach students how to identify and measure different angles, and identify missing angles by measuring the ones they know.

Preparation

Print out the appropriate angles worksheet(s) for the students. Please note the angles on the worksheets are approximated and should not be used for measuring with protractors.

Lesson outline

1. Ask the class to tell you what they know about measuring angles. Remind them that right angles are 90 degrees, angles on a straight line or in a triangle are 180 degrees, and full turns are 360 degrees.

2. Explain that all three angles in an equilateral triangle are 60 degrees because all three are the same. Explain that two of the angles on an isosceles triangle will be equal because two of the sides are the same length. Demonstrate how missing angles can be found using this information.

3. Ask the class to complete the first four questions on the angles worksheet A.

   Answers:
   A. 32
   B. 67
   C. 46
   D. 74

4. Ask if anyone knows how many degrees are in an angle around a point. Explain that angles that are greater than 180 degrees but less than 360 degrees are called reflex angles.

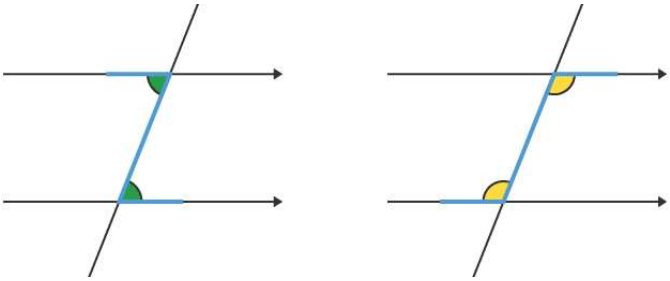
5. Ask the class to complete the remaining questions on angles worksheets A and B.

   Answers sheet A:
   E. 79
   F. 72
   G. 22
   H. 46
   I. 67
   J. 79

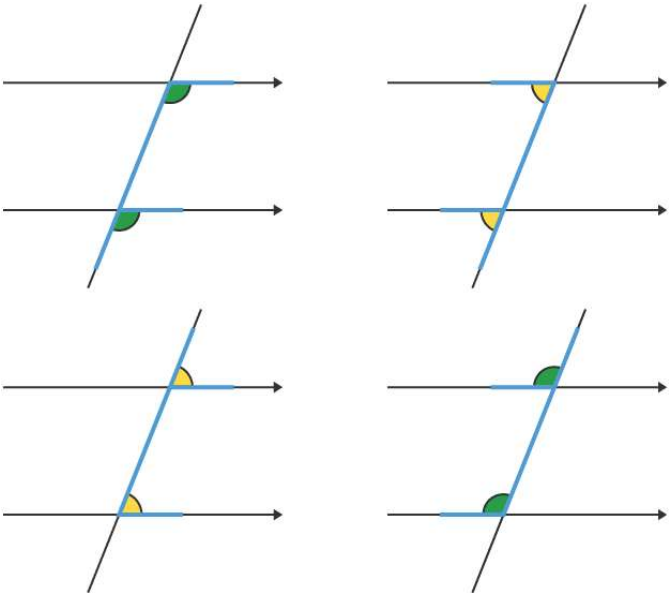
   Answers sheet B:
   A. 30
   B. 210
   C. 64
   D. 59
   E. 298
   F. 62
   G. 59
   H. 235
   I. 289
   J. 45

6. Explain that when two parallel lines are cut by a third (transverse) line that crosses both lines, eight angles are formed. Explain that, depending on the information given, you do not need to measure all of the angles to work them out. Demonstrate that corresponding angles are always equal and alternate angles are always equal.

On parallel lines, alternate (Z) angles are equal:



On parallel lines, corresponding (F) angles are equal:



Continued→

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Mathematics: Bikes and angles (continued)

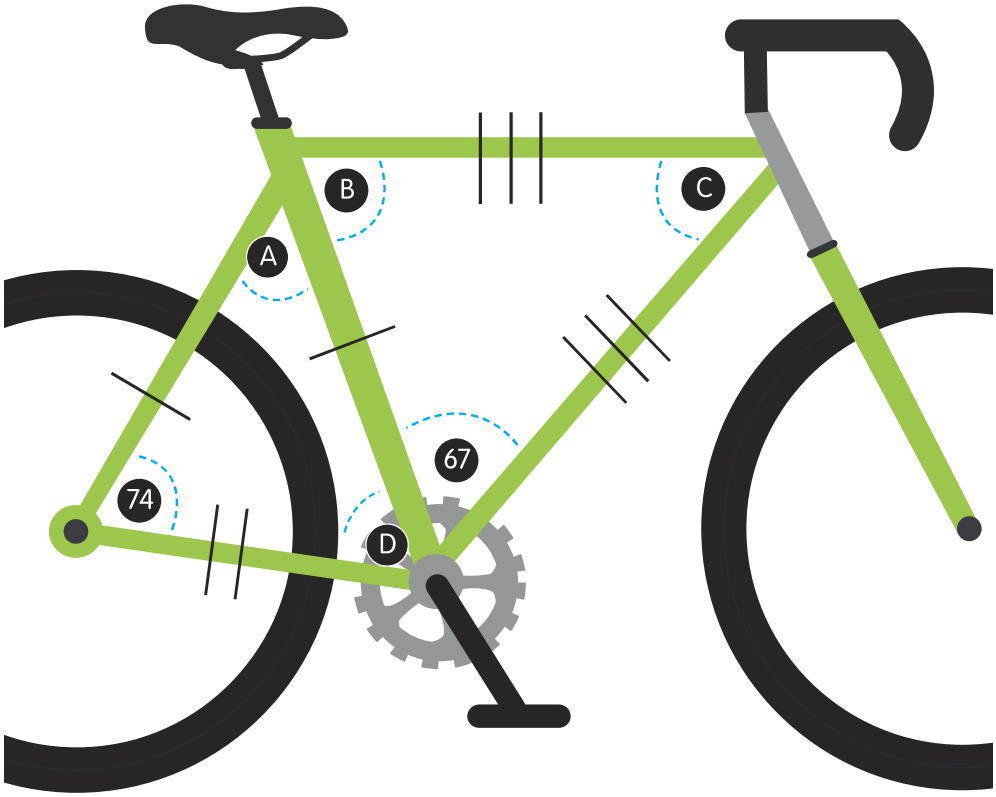
7. Show the class the multi-seater bicycle included on angles worksheet C. Discuss with them some of the possible safety issues on a bike like this, such as the need to be more careful not to overbalance it, or one person having to do all the steering.
Ask the class to complete angles worksheet C.

Answers sheet A:
A. 124
B. 56
C. 73
D. 107
E. 124
F. 107
G. 73

Support materials

Mathematics

Angles worksheet A



Using your knowledge of angles in isosceles triangles, work out the size of the missing angles A–D. Give your answer in degrees.

A. .....

B. .....

C. .....

D. .....

Using your knowledge of angles in isosceles triangles, straight lines and angles around a point, work out the size of the missing angles E–F. Give your answer in degrees.

E. .....

F. .....

G. .....

H. .....

I. .....

J. .....

Support materials

Mathematics

Angles worksheet B

1. All of the angles between the spokes in this wheel are the same size. What size is A? (give your answer in degrees and show your working)

A. .....

.....

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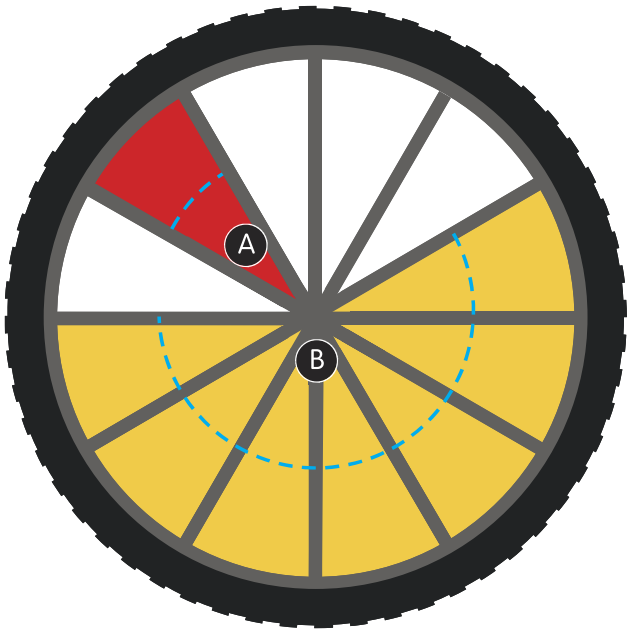
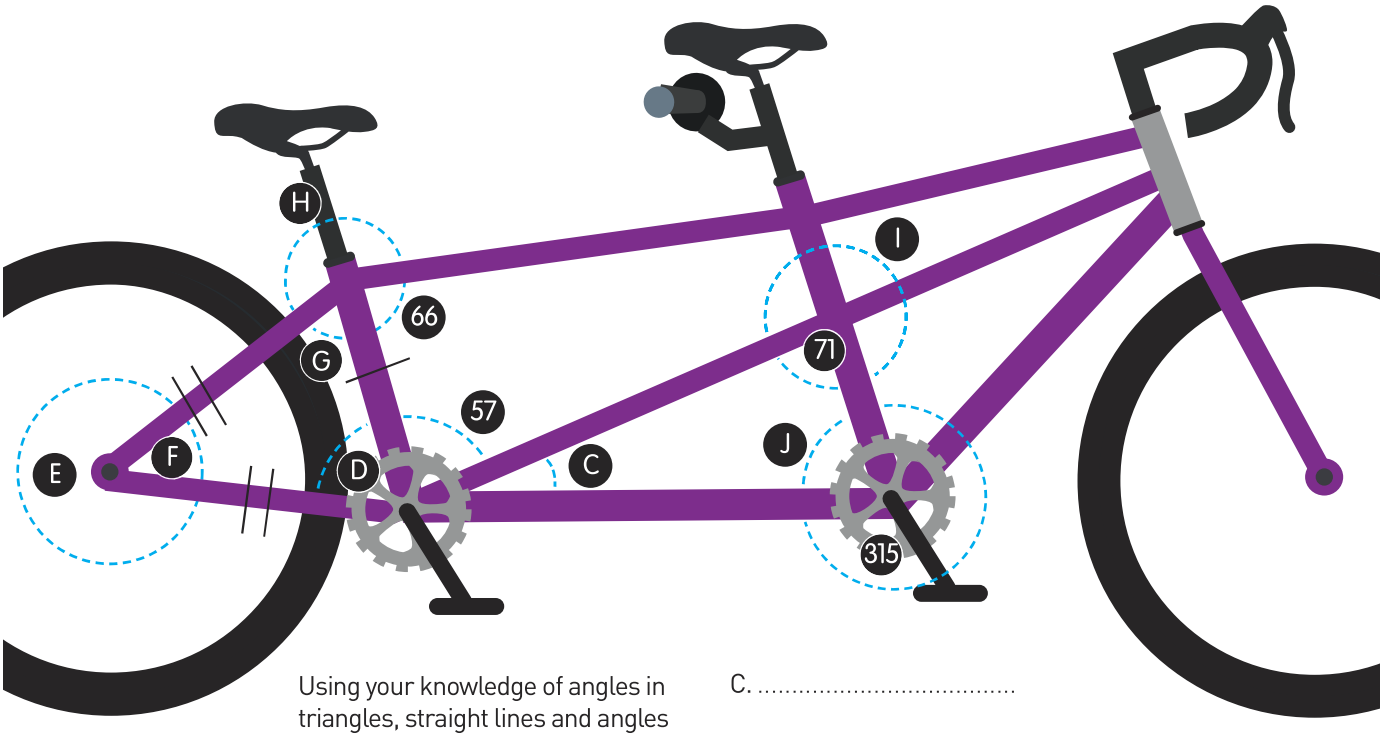


2. What size is angle B? (give your answer in degrees and show your working)

B. .....

.....

.....



Using your knowledge of angles in triangles, straight lines and angles around a point, work out the size of the missing angles C–J. Give your answer in degrees.

C. .....

D. .....

E. .....

F. .....

G. .....

H. .....

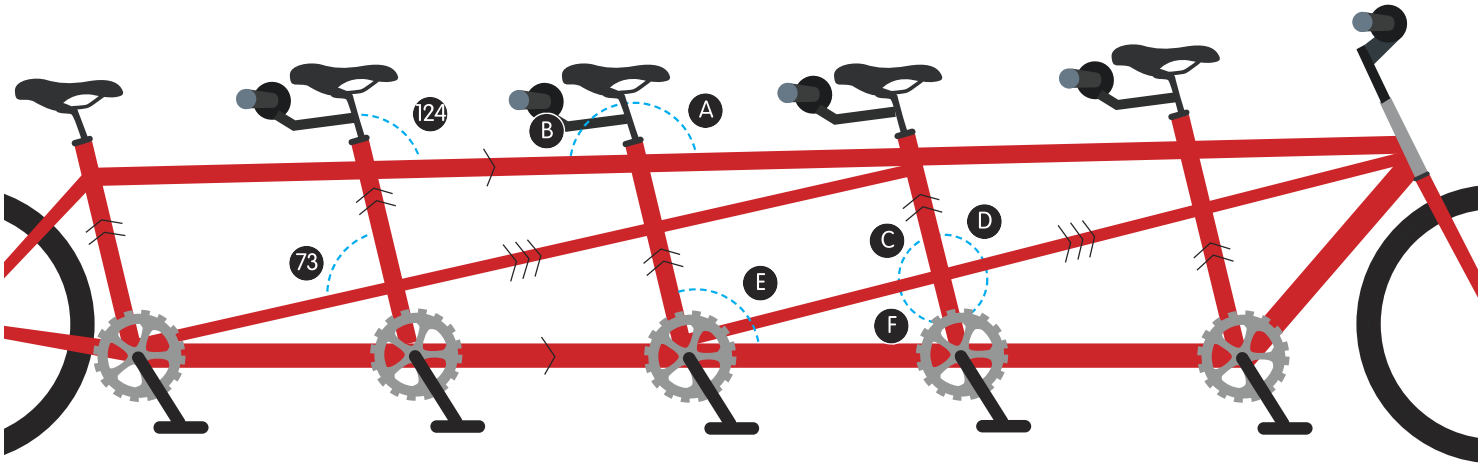
I. .....

J. .....

Support materials

Mathematics

Angles worksheet C



Using your knowledge of angles in parallel lines, work out the size of the missing angles A–G. Give your answer in degrees.

A. .....

B. .....

C. .....

D. .....

E. .....

F. .....

G. .....

Support materials

Mathematics

Extension activity

Why are bikes so full of triangles?
Bicycle design hasn't changed much for nearly 150 years. The most popular form is known as the 'diamond' or 'double-triangle' frame. This design gives a bike great strength and stability, because triangles are the strongest kind of shape.

Imagine a square with a hinge at each corner — it would be really easy to push it out of shape. But triangles are much harder to deform, if not impossible.

Discuss in class why triangles are often used when designing buildings and other structures that need to withstand a lot of pressure.