MATHEMATICS ANGLES

YEAR 5

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EDITOR'S NOTE

Editor's Note

My name is Steve and I set out on a mission to truly empower kids in their educational endeavours. Having been through all the rigorous tests myself and in the education industry for over a decade I have come to understand the fundamental factors required for students to excel in their education.

I know you will find this book valuable and if you would like to speak to my team and I reach out to us here:

https://scholarlytraining.com/

Regards, Steve

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Unit Angles

ANGLES

The concept of angle is one of the most important concepts in geometry. An angle is a form of geometrical shape, that is constructed by joining two rays to each other at their end-points. The angle can also be represented by three letters of the shape that define the angle, with the middle letter being where the angle actually is (i.e. its vertex).

Types of Angles

There are majorly six types of angles in geometry. The names of all angles with their properties are:

- Acute angle – It lies between 0° to 90°.
- Obtuse angle – It lies between 90° to 180°.
- Right angle – The angle which is exactly equal to 90°.
- Straight angle – The angle which is exactly equal to 180°.
- Reflex angle – The angle which is greater than 180° and less than 360°.
- Full Rotation – The complete rotation of angle equal to 360°

Parts of Angles

- Vertex – A vertex is a corner of an angle, a point where two lines/sides meet. O is the vertex in the given figure.
- Arms – the two sides of the angle, joined at a common endpoint. OA and OB are arms of an angle.
- Initial Side – Also known as the reference line, a straight line from where an angle is drawn. OB is the reference line.
- Terminal Side – The side up to which the angle measurement is done. In the given diagram below, OA is the terminal side.

8.1 Supplementary And Complimentary Angles

Supplementary angles and complementary angles are defined with respect to the addition of two angles. If the sum of two angles is 180 degrees and they are said to be supplementary angle, which form a linear angle together. Whereas if the sum of two angles is 90 degrees, then they are said to be complementary angles, and they form a right angle together.

EXAMPLE

1. Two angles are complementary. If one of the angles is double the other angle, find the two angles...

Solution:

Let x be one of the angles. Then the other angle is 2x. Because x and 2x are complementary angles, we have:

$$x + 2x = 90$$

$$3x = 90$$

Divide each side by 3.

$$\frac{3x}{3} = \frac{90}{3}$$

$$x = 30$$

$$2x = 2\ 30 = 60$$

So, the two angles are 30° and 60°.

2. Two angles are complementary. If one angle is two times the sum of other angle and 3, find the two angles.

Solution:

Let x and y be the two angles which are complementary

$$x + y = 90 \quad (1)$$

Given: One angle is two times the sum of other angle and .

$$x = 2(y + 3)$$
$$x = 2y + 6 \quad (2)$$

Now, substitute 2y + 6 for x in (1)

$$2y + 6 + y = 90$$
$$3y + 6 = 90$$

Subtract 6 from each side

$$3y = 84$$

Divide each side by 3

$$\frac{3y}{3} = \frac{84}{3}$$

Substitute 28 for y in (2)

$$x = 2(28) + 6$$
$$x = 56 + 6$$
$$x = 62$$

So, the two angles are 62° and 28°.

3. The measure of an angle is ¾ of 60°. What is the measure of the complementary angle?

Solution:

Let x be the measure of a complementary angle required.
The measure of an angle is ¾ of 60°

$$\frac{3}{4} \cdot 60° = 45°$$

Because x and 45° are complementary angles,

$$x + 45 = 90$$

Subtract 45 from each side

$$x = 45$$

So, the measure of the complementary angle is 45°.

4. Two angles are supplementary. If one angle is 36° less than twice of the other angle, find the two angles.

Solution:

Let x and y be the two angles which are supplementary.

$$x + y = 180 \quad (1)$$

According to the problem, one angle is 36° less than twice the other angle.

$$x = 2y - 36 \quad (2)$$

Now, substitute 2y - 6 for x in (1)

$$2y - 36 + y = 180$$

$$3y - 36 = 180$$

Add 36 to each side.

$$3y = 216$$

Divide each side by 3.

$$\frac{3y}{3} = \frac{216}{3}$$

$$y = 72$$

Now, substitute 72 for y in (2).

$$x = 2(72) - 36$$

$$x = 144 - 36$$

$$x = 108$$

So, the two angles are 108° and 72°

5. Two angles are supplementary. If 5 times of one angle is 10 times of the other angle. Find the two angles.

Solution:

Let x and y be the two angles which are supplementary

$$x + y = 180 \quad (1)$$

Given that 5 times of one angle is 10 times of the other angle.

$$5x = 10y$$

Divide each side by 5.

$$\frac{5x}{5} = \frac{10y}{5}$$

$$x = 2y \quad (2)$$

Substitute 2y for x in (1)

$$2y + y = 180$$

$$3y = 180$$

Divide each side by 3

$$y = 60$$

Substitute 60 for y in (2)

$$x = 2\,(60)$$

$$x = 120$$

So, the two angles are 60° and 120°.

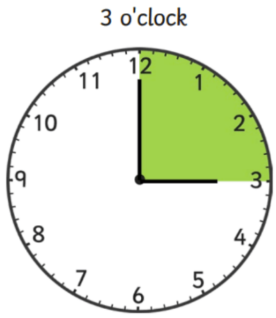
8.2 Angles On Analog Clocks

A clock angle is a mathematical problem that is associated with two important concepts: angles and time. You would typically use an analogue clock to measure the angle in the problem in degrees from the mark 12.

This clock hand will move 360° in 12 hours. In an hour period, the clock angle will be 30°. This is because 360° divided by 12 equals 30. Alternatively, you could think of the hour hand moving 0.5° per minute. On the other hand, if we want to work out the angle produced by the minute hand, you need to think about how long it takes for the hand to make a full revolution. In 60 minutes (1 hour), the hand moves 360°. Therefore, in 1 minute, the hand will produce a 6° angle. This is because 360° divided by 6 equals 6°.

EXAMPLE

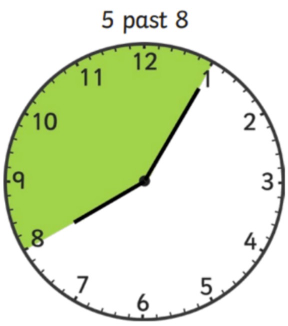
1. What angle is produced by this clock at 3 o'clock?



Solution:

In 3 hours, the clock hour hand will have made 3 revolutions. It has therefore moved 3×30° and the answer is 90°. This is a right angle.

2. What angle is produced by the clock at 5 minutes past 8 on this clock?



Solution:

This question is a little trickier. One way to figure out the angle is to count the different in time between the hands. For this question, it is easier to focus on the movement the minute hand has made. It is simpler to look at the angle in the movement of the hand in a clockwise fashion.

The minute hand has moved in 25 minutes from the hour hand. Using our knowledge of how far the minute hand travels, we can work out the angle is 150°, i.e. 25 ×6°=150°.

3. What is the angle formed by the minute hand and the hour hand at 4:45?

Solution:

The angle measure between any two consecutive numbers on a clock is $\frac{360}{12} = 30°$. At 4 : 45 , the minute hand is at the "9" – that is, at the $30 \times 9 = 270°$ mark. The hour-hand is three-fourths of the way from the "4" to the "5"; that is

$$30 \times 4 \frac{3}{4} = 142.5° \text{ mark}$$

Therefore, the angle between the hands is

$$270 - 142.5 = 127.5°$$

4. The hour hand on a clockface points to the 2, and the minute hand points to the 7. How many degrees is the angle between the minute and hour hands?

Solution:

There are 360 degrees in one complete revolution of a circle. There are 60 minutes in one hour. Create a fraction out of these two quantities to use later as a conversion rate:

$$\frac{360 \text{ degrees}}{60 \text{ minutes}} = \frac{6 \text{ degrees}}{1 \text{ minute}}$$

Between the 2 and 7 there are 25 minutes, so multiply this by the conversion rate to solve for the number of degrees:

$$25 \text{ minutes} \bullet \frac{6 \text{ degrees}}{1 \text{ minute}} = 150 \text{ degrees}$$

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