Math 3 Classwork 15

Warm Up

1

Solve for x:

$x - (18 + 24) = 29$ $(65 - 39) + b = 81$

2

The width of a rectangle is 12 cm, and the length is 3 times longer. Find a perimeter of this rectangle.

P = ________________________

3

Compare, using <, > or =:

15×4 ___ 16×2 21×3 ____ 22×2 14×5 ____ 12×7

Homework Review

4

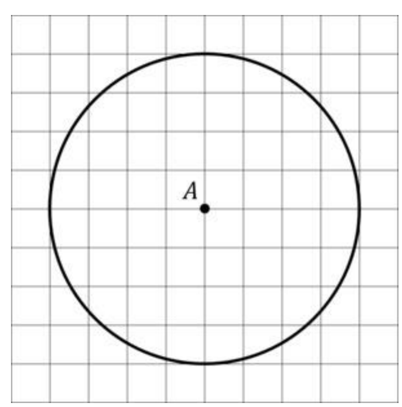
What types of angles are formed by the hour hand and the minute hand on the clock face at the following times (right, obtuse, acute, straight) ?

a) 3 o'clock - angle ________ b) 4 o'clock - angle ________

c) half past 9 - angle ________ 11 o'clock - angle ________

5

A circle with center *A* is drawn on 1cm grid paper as shown below.
What is the radius of the circle?
Draw another circle with a radius 2 times less than the radius of the circle on the picture.



New Material I

In mathematics, the word "**division**" means the operation, which is the opposite of multiplication, the symbol for division can be a slash, a line, or the division sign (÷), as in :

$$6/3 \quad \text{or } \frac{6}{3} \quad \text{or } 6 \div 3$$

Each of those three, means "6 divided by 3" giving 2 as the answer. The first number is the **dividend** (6), the second number is the **divisor** (3), and the result (or answer) is the **quotient.**

Two meanings of division:

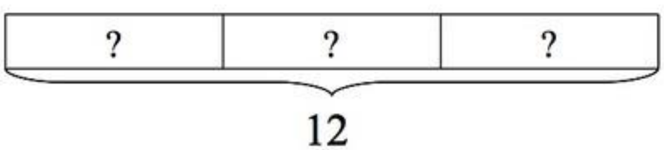
6 *Example:* Let's consider two problems:

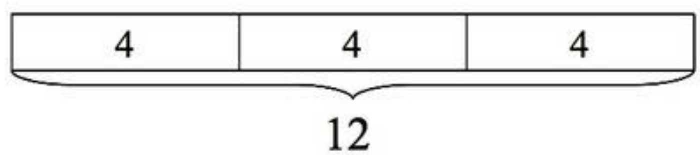
1. Diana cuts 12 feet of ribbon into 3 equal pieces so she can share it with her two friends. How long is each piece?
2. Diana has 12 feet of ribbon and wants to wrap some gifts. Each gift needs 3 feet of ribbon. How many gifts can she wrap using the ribbon?

Solution I: Tape Diagram

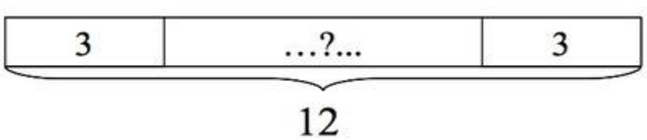
1. In the 1st problem the question asks: "how long is each piece?", so it is a "How many feet in each piece (group)?" division problem. **3 × ? =12**

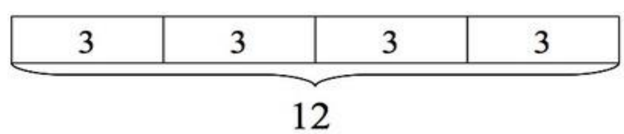
12 ÷ 3 = 4, so each child gets a piece of ribbon that is 4 feet long.





2. In the 2nd problem the question asks: "How many gifts can she wrap using the ribbon?", so it is a "How many groups are there?" division problem **? × 3 = 12**

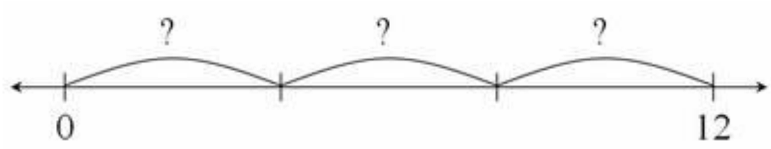


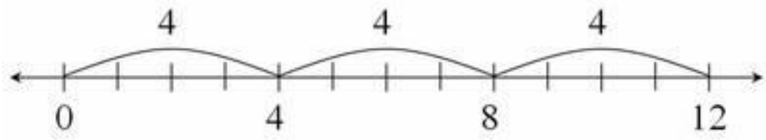


12 ÷ 3 = 4, so Diana can wrap 4 gifts.

Solution II: Number Line

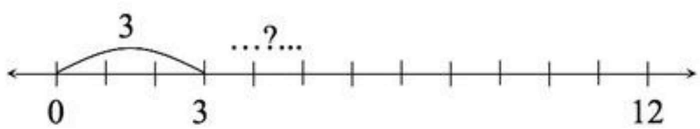
1. In the 1st problem the question asks: "how long is each piece?", so it is a "How many feet in each piece (group)?" division problem. **3 × ? = 12**

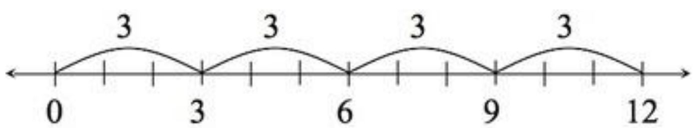




12 ÷ 3 = 4, so each child gets a piece of ribbon that is 4 feet long.

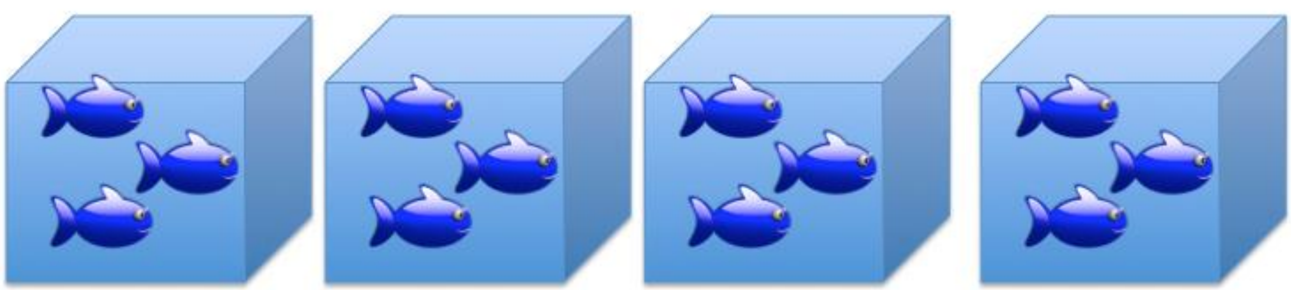
2. In the 2nd problem the question asks: "How many gifts can she wrap using the ribbon?", so it is a "How many groups are there?" division problem. **? × 3 =12**





12 ÷ 3 = 4, so Diana can wrap 4 gifts.

7 There are 4 tanks and 3 fish in each tank. The total number of fish in this situation can be expressed as 4 × 3 =12 or 3 × 4 = 12



1. Describe the problem being solved in this situation: 12 ÷ 3 = 4

2. Describe the problem being solved in this situation: 12 ÷ 4 = 3

8

Describe the problem 12 ÷ 6 = 2 in 2 different ways. Draw 2 different pictures to support your descriptions (use any objects – balls, balloons, apples, something what is easy to draw):

1.

2.

REVIEW

9

Answer the questions and check your answers:

1. How many 5s are in 15? ______________________________
2. How many 4s are in 24? ______________________________
3. How many 10s are in 120? ____________________________
4. How many 3s are in 60? ______________________________

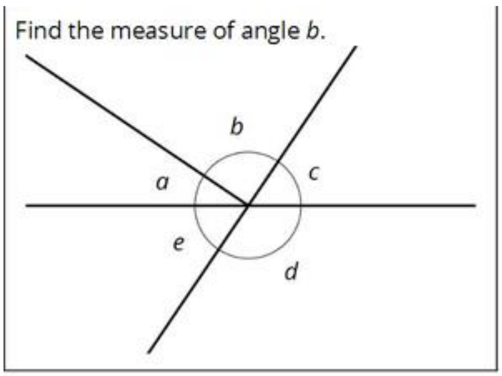
10

We know that:

- Angles ***a*** and ***c*** are complementary angles
- The measure of angle ***d*** = 124^0
- The measure of angle ***c*** = 56^0
- Angles ***c*** and ***e*** have equal measures.

Find: The measure of angle ***b*.**

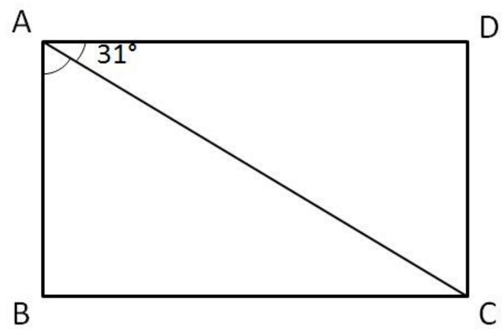
Angle ***b*** =



11

In the figure, *ABCD* is a rectangle and ∠*CAD* = 31°.
Find ∠*BAC*

____



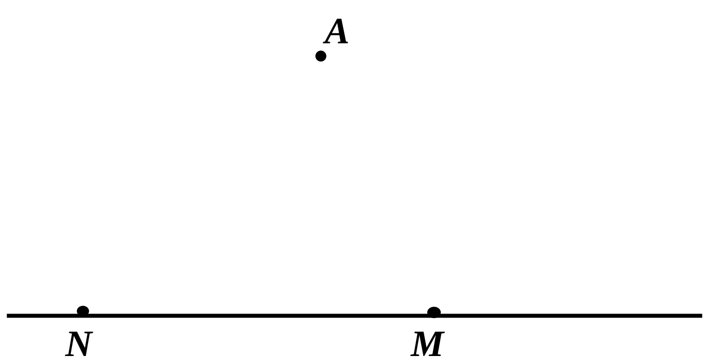
New Material II

How to find a midpoint between any two points ***A*** and?
How to find points which are the same distance away from any two points?

Let me introduce to you a “magic” line – every single point on that line will be the same distance away from any two points ***A*** and ***B***.

12 There is a line ***MN*** with points ***M*** and ***N*** on it. A line segment ***MN*** is a part of line ***MN.***

a) See the point below, marked by the letter ***A***.
b) Draw a circle centered at point A with a radius equal to the length of a line segment ***MN***.



c) Put the point on the circle and mark it by the letter *B*.
d) Draw another circle centered at the point *B*, that goes through point *A* (it also should have a radius equal to the length of segment ***MN***)
e) Draw a line segment between points A and *B*.
We know that:

- The distance between centers of both circles - points *A* and *B* is equal to the distance between points *M* and *N*.
- All points on the circle centered at a point *A* are at the distance *MN* or at the distance *AB* away from a point *A*.
- All points on the circle centered at a point *B* are at the distance *MN* or at the distance *BA* from a point *B*.

Our two circles intersect in 2 points. Let’s name them *C* and *D*. What can you say about those two points?
Line ***CD*** is our “magic” line - every single point on that line will be at the same distance away from both points ***A*** and ***B.*** Choose any points on that line and use a compass to check this statement.

13

Use a sketch from the problem #12.

a) Using a ruler, connect points ***A*** and ***B*** (centers of two circles you draw). Label the point of intersection of two lines – ***AB*** and ***CD*** by point ***O***.

b) You should get four triangles. Write down their names: ______________________________

c) Look at the angles $\angle AOC, \angle COB, \angle BOD \ and \ \angle DOA$. What can you tell about these angles?

d) What are their measures?

e) Write down all pairs of adjacent angles __________________________

f) Write down all pairs of supplementary angles _____________________

Did you Know …?

A full circle is 360 degrees, but why?

You must wonder what reasons there might be for using 360 degrees to represent a circle.

1. Mathematical reasons (Theory # 1):

The number 360 is divisible by every number from 1 to 10, aside from 7. It divides into 24 different numbers: 1,2,3,4,5,6,8,9,10,12,15,18,20,24,30,36,40,45,60,72,90,120,180 and 360 itself. These 24 numbers are called **the divisors** of the number 360.

Having so many divisors make 360 a **highly composite number**. Numbers are highly composite if they are positive integers with more divisors than any smaller positive integer has. The only highly composite numbers below 360 are 2, 6, 12, 60, and 120. Highly composite numbers are considered good base numbers to perform standard calculations. For example, 360 can be divided into two, three, and four parts and the resulting numbers – 180, 120, and 90 are the whole numbers.

2. The length of a year (Theory #2):

Have you all ever wondered why there are precisely 365 days in a year? Why wouldn't we use a more convenient number like 300 or 400? Ancient astronomers, mainly the Persians and the Cappadocians, noticed that the sun took 365 days to come back to the same position. So, they decided to round that down to 360 days per year for simplicity. In other words, the sun advances by one degree each day along its elliptical path. The Persians had a leap month every six years to adjust for the five extra days. Also, the lunar calendar has 355 days, while the solar calendar has 365. And what number sits perfectly between the two and is a highly composite number? Yes… 360!

3. Historical reasons (Theory #3):

The Sumerians and Babylonians were known to use the **Sexagesimal** numeral system. The sexagesimal system has a base value of 60, whereas the current system we use is known as the decimal system and has a base value of 10. Once we reach the 10th number, we repeat the symbols (of previous numbers, from 0 to 9) to form new numbers.

The Babylonians had 60 different symbols with which they formed numbers. Again, why would they use 60? Because 60, just like 360, is a highly composite number with 12 factors. Just as we can count 10 on our fingers for the decimal system, we can also count 60. Start by counting the knuckles of the four fingers (not the thumb) on your right hand. 12, right? Now, on the other hand, raise any of those fingers to remember that you finished one iteration and got the number 12. Repeat the same procedure as many times as the number of fingers remaining on the left hand. The number you will end up with is 12 knuckles x 5 fingers = 60.