**Examples – calculating angles related to polygons**

1) Find the sum of the degree of the measures of the interior angles of a regular polygon that has 8 sides.

2) How would you find the measure of ONE interior angle?

3) Find the number of sides in a polygon whose sum of the interior angles is 1440.

4) Find the sum of the degree of the measures of the interior angles of a regular polygon that has 16 sides.

5)What is the measure of 1 angle (assuming the polygon is regular)?

6)Find the number of sides in a polygon whose sum of the interior angles is 1800.

7)What is the measure of 1 angle (assuming the polygon is regular)?

Problems II

Problem A

#1) Find the sum of the degree of the measures of the interior angles of a regular polygon that has 13 sides.

#2) What is the measure of one interior angle?

Problem B

#1) Find the sum of the degree measures of the interior angles of a regular polygon that has 17 sides.

#2) What is the measure of one interior angle?

Problem C

Find the number of sides in a polygon whose sum of the interior angles is 2700.

Problem D

#1) Find the sum of the degree measures of the interior angles of a regular polygon that has 15 sides.

#2) What is the measure of one interior angle?

Obrázok, na ktorom je text

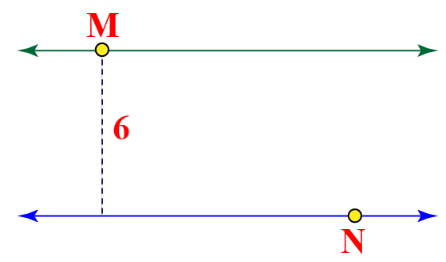
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**Examples – geometric constructions**

**Example 1**

The green and blue lines are parallel, and M and N are points on the green and blue lines respectively.

If the shortest distance from M to the blue line is 6 units.



What will be the shortest distance from N to the green line?

**Solution**

The given lines are parallel, so they are equidistant throughout.

This means that the perpendicular distance from M to the blue line is equal to the perpendicular distance from N to the green line. Hence, this distance is equal to 6 units.

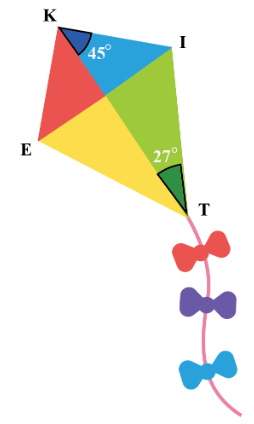
In fact, the shortest distance between the two lines is the perpendicular distance between them.

So, the shortest distance from N to the green line is 6 units.

**Example 2**

Ryan is flying a kite.

The kite has two angles bisected as shown below.



Can you find the measures of the angles ∠EKI and ∠ITE?

**Solution**

The angles ∠EKI and ∠ITE are bisected by the line KT↔.

KT↔ divides the angles  ∠EKI and  ∠ITE in two equal angles respectively.

Thus,

∠EKI=2×45°=90°

and

∠ITE=2×27°=54°

**Example 3**

Ms. Amy asked Mia to justify the construction of a perpendicular bisector of a line segment.

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Can you help her justify this?

**Solution**

In ΔPAQ and ΔPBQ:

1. PA = PB (arcs of equal radius)

2. QA = QB (again, arcs of equal radius)

3. PQ = PQ (common)

By the SSS criterion, the two triangles are congruent, which means that

∠APO = ∠BPO

In ΔAPO with ΔBPO:

1. PA = PB (arcs of equal radius)

2. ∠APO = ∠BPO (just shown)

3. PO = PO (common)

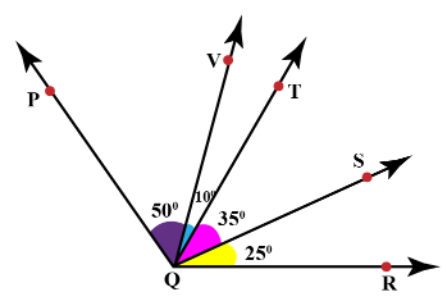
By the SAS criterion, the two triangles are congruent, which means that AO = BO, and also:

∠AOP = ∠BOP = 180°/2=90°

POQ is the perpendicular bisector of AB.

**Example 4**

∠PQR is divided into different angles.



Can you determine the angle bisector of ∠PQR∠PQR?

**Solution**

Notice that,

∠PQT=∠PQV+∠VQT=50°+10°=60°∠PQT=∠PQV+∠VQT=50°+10°=60°

∠TQR=∠TQS+∠SQR=35°+25°=60°∠TQR=∠TQS+∠SQR=35°+25°=60°

This means that ∠PQT=∠TQR

So, ray QT is the angle bisector of  ∠PQR.

**Examples – Logical Thinking Measurement Comparison Conversion 1**

1) Find the area of a square park whose perimeter is 360 m.

2) If the perimeter of a rectangle is 60 cm and its length is 5 times the width, find the area of the rectangle.

3) Find the area of a triangle with a base of 10 meters and a height of 5 meters.

4) a) 16 m= \_\_\_\_\_mm

b) 45 deci meter = \_\_\_ m

c) 68 millimeter = \_\_\_\_\_m

5) a) Convert 3 m2 to  cm2

b) Convert 45 000 cm2 to m2

c) Convert 7800 mm2 to cm2

**Answer key**

1) Given: Perimeter of the square park = 360m  
We know that,  
Perimeter of a square = 4 × side  
⇒ 4 × side = 360  
⇒ side = 360/4  
⇒ side = 90m  
Area of a square = side2  
Hence, Area of the square park = 902 = 90 × 90 = 8100 m2  
Thus, the area of a square park whose perimeter is 360 m is 8100 m2.

2) Let the width be x.

Length is 5 times its width, length = 5x.

But the perimeter of a rectangle =2(l + w) = 60 cm

Substitute 5x for l and x for w.

60 = 2(5x + x)

60 = 12x

Divide both sides by 12 to get.

x = 5

Now substitute x = 5 for the equation of length and width.

Therefore, width = 5 cm and length = 25 cm.

But the area of a rectangle = l x w

= (25 x 5) cm2

= 125 cm2

3) Let us find the area using the area of triangle formula:

Area of triangle = (1/2) × b × h

A = 1/2 × 10 × 5

A = 1/2 × 50

Therefore, the area of the triangle (A) = 25 m2

4) a)  1 meter = 1000 milli meter

    16 meter = 16 × 1000

       = 16000 mm

b) 1 deci meter = 0.1 m

45 deci meter = 45 × 0.1

= 4.5 m

c) 1 millimeter = 0.001 meter

68 millimeter = 68 × 0.001

= 0.068 m

5)

a) The units involve metres and centimetres

1 m=100 cm

The question involves square units, so we need to square the unit conversion.

1002 = 10000

As we are going from larger units to smaller units we multiply.

3 x 1002 = 3 x 10 000=30 000

So, 3 m2  is 30 000 cm2

b) The units involve metres and centimetres

1 m=100 cm

The question involves square units, so we need to square the unit conversion.

1002 = 10000  
As we are going from smaller units to larger units we divide.

45 000 / 1002 =45 000 / 10 000 =4.5

So, 45 000 cm2  is  4.5 m2

c) The units involve centimetres and millimetres

1 cm= 10 mm

The question involves square units, so we need to square the unit conversion.

102 = 100

As we are going from smaller units to larger units we divide.

7800 / 102 =7800 / 100 =78

So, 7800 mm2  is  78 cm2

**Examples – Logical Thinking Measurement Comparison Conversion 2**

1) Joe loves playing with building blocks. He built a structure with 15 cubes. If the length (edge) of each cube is 3 cm, what would be the volume of his structure?

2) Calculate the volume of a cylinder with a length of 20cm, and whose circular end has a radius of 2.5cm.

3) Which is bigger by volume, a sphere with radius 2cm or a pyramid with base 2.5cm square and height of 10cm?

4) calculate the volume of a cone with a radius of 5cm and a height of 10cm

5) A right rectangular pyramid is based on a square, and the vertical height is the same value as the sides of the square.

If the volume of the pyramid is 72 cm3, what is the area of the base of the pyramid?

6) Convert:

500mm3= cm3

3m3 = cm3

25dm3 = mm3

3.8L = cm3

12.4dm3 = dL

290cm3 = L

**Answer Key**

1) Let's calculate the volume of one cube. Volume of Cube = Edge × Edge × Edge = 3 × 3 × 3 = 27 cm³

There are 15 cubes in his structure. So, the volume of the whole structure is:

Volume of structure =15 × volume of one cube = 15 × 27 = 405 cm³

Volume of the structure is 405 cm³.

2) First, work out the area of one of the circular ends of the cylinder.

The area of a circle is πr2 (π × radius × radius). π (pi) is approximately 3.14.

The area of an end is therefore:

3.14 x 2.5 x 2.5 = 19.63cm2

The volume is the area of an end multiplied by the length, and is therefore:

19.63cm2 x 20cm = 392.70cm³

3) First, work out the volume of the sphere.

The volume of a sphere is 4/3 × π × radius³.

The volume of the sphere is therefore:

4 ÷ 3 x 3.14 × 2 × 2 × 2 = 33.51cm³

Then work out the volume of the pyramid.

The volume of a pyramid is 1/3 × area of base × height.

Area of base = length × breadth = 2.5cm × 2.5cm = 6.25cm2

Volume is therefore 1/3 x 6.25 × 10 = 20.83cm³

The sphere is therefore larger by volume than the pyramid.

4) The area within a circle = πr2 (where π (pi) is approximately 3.14 and r is the radius of the circle).

In this example, area of base (circle) = πr2 = 3.14 × 5 × 5 = 78.5cm2.

78.5 × 10 = 785

785 × 1/3 = 261.6667cm³

5) Let h,l,w=x as they are all the same value

Pyramid: V=1/3 hlw

Substituting 72=1/3 x³

216=x3

x=6

Area of base A=x2

A=36

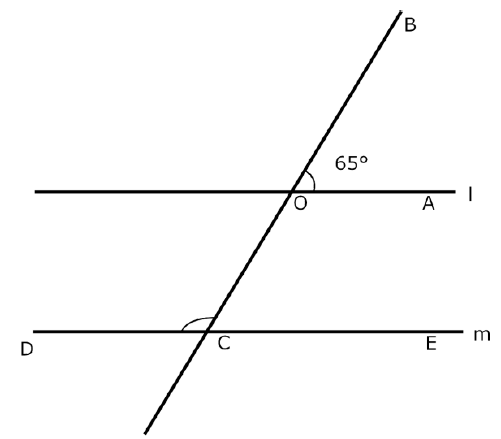
6) 0.5cm³ , 3 000 000cm³ , 25 000 000mm³ , 3800cm³ , 124dL , 0.29L

**Examples – Relationships between angles**

**Angle Relationships – Meet the Skill**

Find the measures of the marked ∠DCO. Do not measure them. Line l and m are

parallel.

****

When two parallel lines are crossed by another line (which is called the

Transversal), the angles in matching corners are called corresponding angles.

Here line l is parallel to line m and line BC is angle bisector of both these parallel

lines.

So ∠OCE will be of 65°.

Two angles are supplementary if they add up to 180 degrees.

Here ∠DCO and ∠OCE are supplementary because they both lie on a same point of a

line and made by transversal line.

∠DCO + ∠OCE = 180°

∠DCO + 65° = 180°

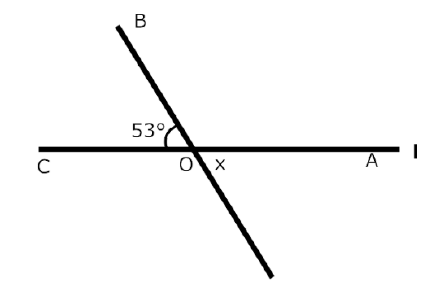
∠DCO = 180° - 65°

∠DCO = 115°

Answer: 115°

**Angle Relationships – Try the Skill**

Find the measures of the marked ∠BXA. Do not measure them.



Here a line l is intersected by another line that makes four angles on point O.

On the upper portion of line l the ∠BOC and ∠BOA are supplementary angles. So their

total will be equal to 180°.

∠BOC + ∠BOA =180°

53° + ∠BOA =180°

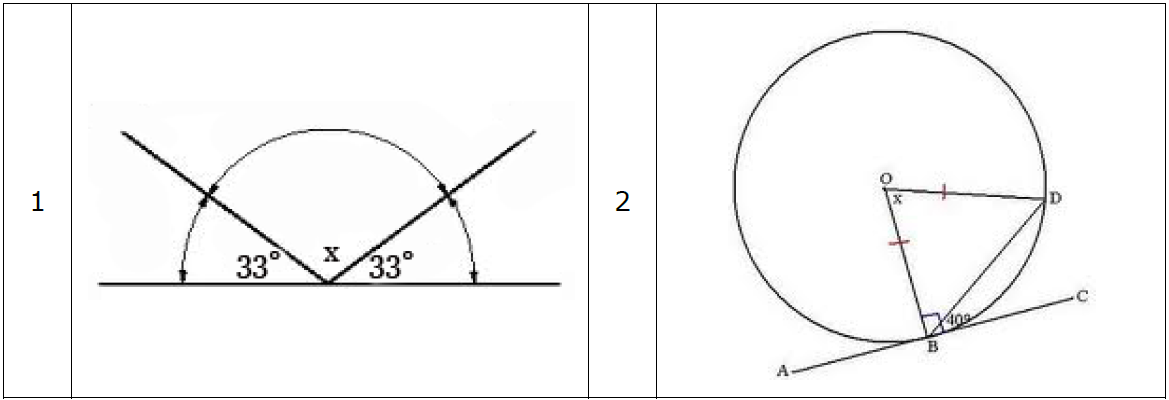
∠BOA =180° - 53°

∠BOA =127°

Answer: 127°

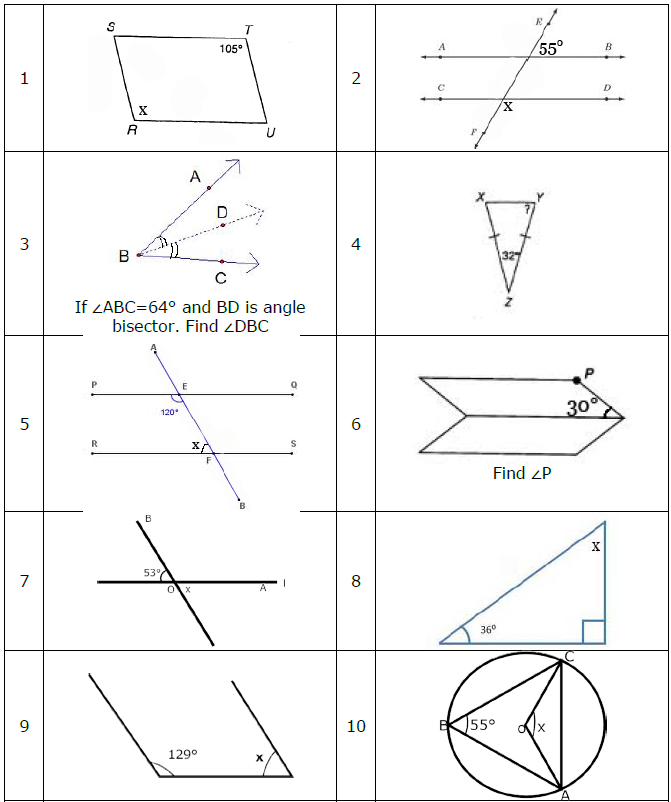
Practice Problems.

Find ∠x



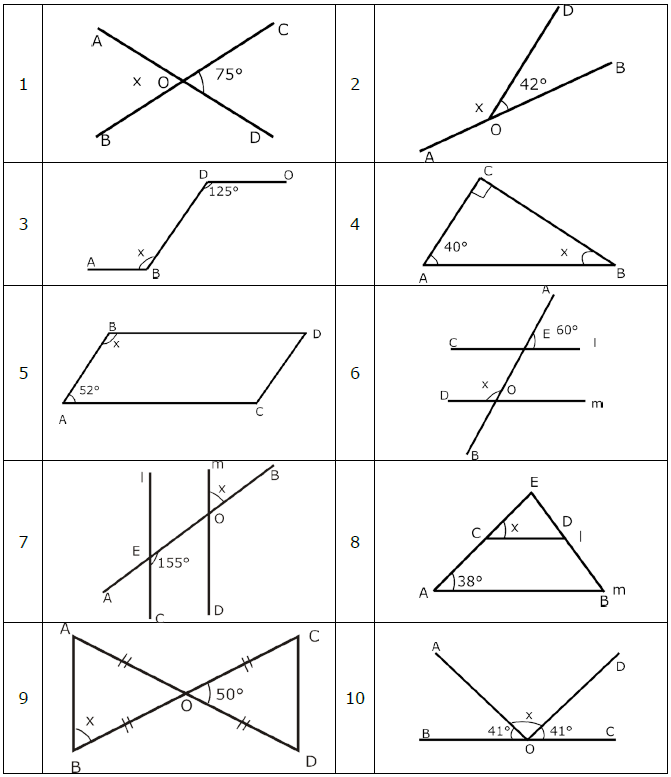
**Angle Relationships – Practice the Skill**

Find the measures of the marked angle x. Do not measure them.



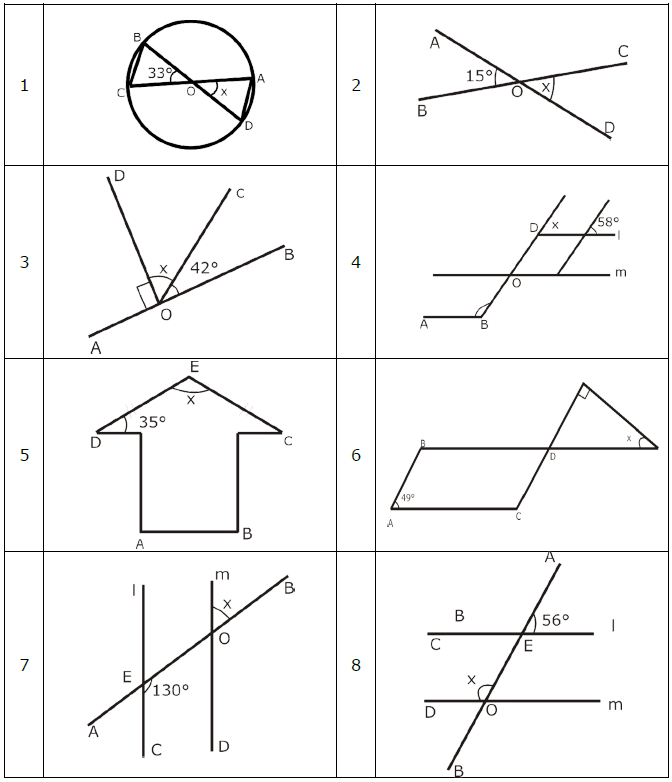
**Angle Relationships – Practice the Skill Twice**

Find the measures of the marked angle x. Do not measure them.



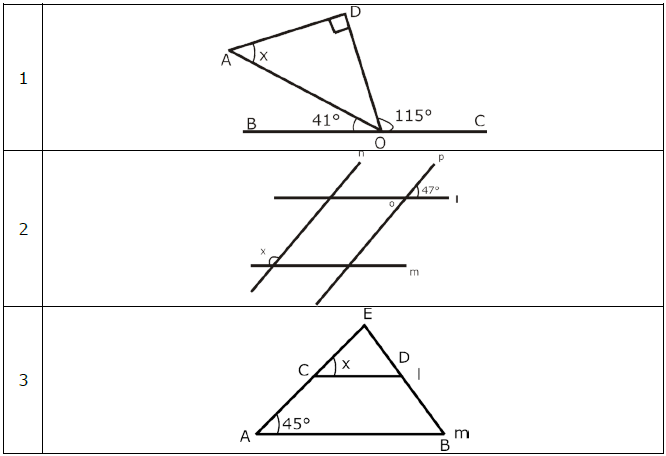
**Angle Relationships – Show the Skill**

Find the measures of the marked angle x. Do not measure them.



**Angle Relationships – Warm Up**

Find the measures of the marked angle x. Do not measure them.



**Angle Relationships – Answer Key**

**Obrázok, na ktorom je text

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