



You are logged in as Raquel Grayson. [Return To Your Account](#)

Large Test - 7th Grade Mathematics PSSA (PA Core)

Instructions: Complete each question by choosing or typing in the best answer. To receive the highest score, be sure to leave nothing blank. When you have completed the test, click the "Grade My Test Now" button at the end of the test. If you run out of time, click the "Save for Me to Complete Later" button. Tests are automatically saved in case of internet disruption.

Language: [English](#) | [Español](#)

- 1) Which property explains why these two expressions are equal?

$$a(b + c) = a(c + b)$$



- A) identity property
- B) symmetric property
- C) associative property
- D) commutative property

- 2) Choose the situation in which the use of approximate numbers is most appropriate.



- A) planting trees in your yard
- B) ordering chairs for a kitchen table
- C) purchasing barbeque to serve at a party
- D) ordering uniforms for the high school basketball team

- 3) Which expression is equivalent to $2(4x)$?



- A) $2 + 4x$
- B) $(2 \times 4)x$
- C) $(2+4x) \times (2 + 4x)$
- D) $(2 \times 4) + (4 \times 2x)$

4)

On average students attend school 170 of the 180 days required in a year. About what part of the required days do they attend school?



- A) 6%
- B) 9.4%
- C) 84%
- D) 94%

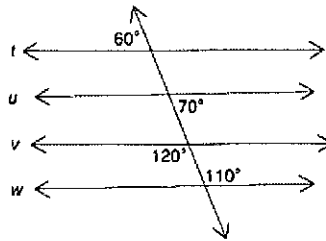
5)

The equation $y = 4x + 4$ describes the relationship between the quantities x and y . Are the quantities in a proportional relationship?



- A) Yes, because the graph of the equation is a straight line.
- B) No, because the graph of the equation is not a straight line.
- C) Yes, because the graph of the equation passes through the origin.
- D) No, because the graph of the equation does not pass through the origin.

6)



Determine which statement is true.



- A) $t \parallel u$ and $v \parallel w$
- B) $t \parallel w$ and $u \parallel v$
- C) $t \parallel v$ and $u \parallel w$
- D) $t \parallel u$ and $u \parallel v$

7)



Sunday: $1\frac{1}{2}$

Monday: 1

Tuesday: $2\frac{1}{2}$ Wednesday: $1\frac{3}{4}$

Thursday: 2

Friday: $1\frac{1}{2}$

Saturday: 2

Jenna is a swimmer and trains every day. The schedule shown outlines the number of hours she trains each day. If she misses the Wednesday practice, what is the total number of hours that she trains?



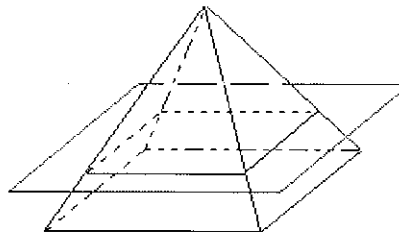
- A) $10\frac{1}{2}$ hours
- B) 10
- C) $11\frac{3}{4}$ hours
- D) 12 hours

- 8) Find the volume of a box that is 2 in x 4 in x 3 in.



- A) 2 ft^2
- B) 2 ft^3
- C) 24 in^2
- D) 24 in^3

- 9)



This pyramid is cut by the plane shown. The plane is parallel to the base of the square pyramid. What is the shape of the cross-section?



- A) rectangle.
- B) rhombus.

- C) square.
- D) triangle.

10)

Equivalent Ratios

x	y
3	6
?	10
7	14

What number is missing from the table of equivalent ratios?



- A) 2
- B) 5
- C) 7
- D) 13

11)

The city of Atlanta recently increased their sales tax from 7.5% to 8%. How much more tax would you pay on a \$10 purchase?



- A) \$.01
- B) \$.05
- C) \$.07
- D) \$.50

12)

The amount of money Jeff earns varies directly with the number of hours he works. Jeff worked 40 hours and earned \$560. What is the constant of variation for Jeff's earnings?



- A) 14
- B) 40
- C) 510
- D) 560

13) $48 - (-12) =$



- A) -60
- B) -36
- C) 36
- D) 60

14) Diana bought a car for \$5000 and plans to sell it to make a 20% profit. What should she sell it for to make the profit she desires?



- A) \$1,000
- B) \$4,000
- C) \$5,100
- D) \$6,000

15) Multiply and simplify.

$$(x + 3)^2$$



- A) $6x + 9$
- B) $x^2 + 9$
- C) $x^2 + 15x$
- D) $x^2 + 6x + 9$

16)



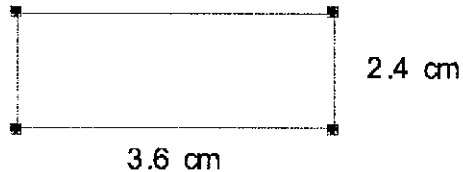
- Group A: 80 trials
- Group B: 50 trials
- Group C: 30 trials
- Group D: 65 trials

Four groups of students are doing a probability experiment with a standard number cube to see how many times they roll a 4 out of 500 trials. The theoretical probability of rolling a 4 is $\frac{1}{6}$ or approximately 0.17 and one group came close to this probability with an experimental probability of 0.175. This MOST LIKELY came from which group?



- A) Group A
- B) Group B
- C) Group C
- D) Group D

17)



The actual length (L) of a rectangle is 27 centimeters. Use the scale drawing of the rectangle to find the actual width (W).



- A) 9 cm
- B) 15 cm
- C) 18 cm
- D) 32.5 cm

18)

Jimmy loaded three bags of sand into his wheelbarrow. The bags weighed $24\frac{1}{2}$ lbs, $32\frac{3}{5}$ lbs, and $44\frac{1}{8}$ lbs. The total amount of sand in the wheelbarrow is



- A) $100\frac{1}{3}$ lbs.
- B) $100\frac{9}{40}$ lbs.
- C) $101\frac{1}{3}$ lbs.
- D) $101\frac{9}{40}$ lbs.

19)

Mark flips a coin twice. How many outcomes are in the sample space?



- A) 1

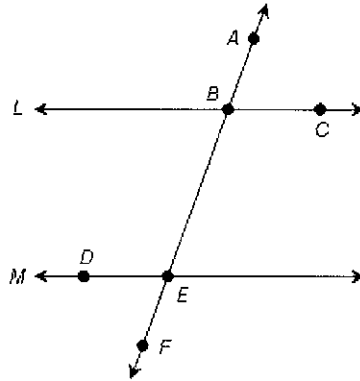
- B) 2
- C) 3
- D) 4

20) You are rolling a die and you have rolled for the last 10 times an even number. What is the probability that your next roll will be an odd number?



- A) $\frac{1}{2}$
- B) $\frac{1}{4}$
- C) $\frac{1}{5}$
- D) $\frac{2}{6}$

21)

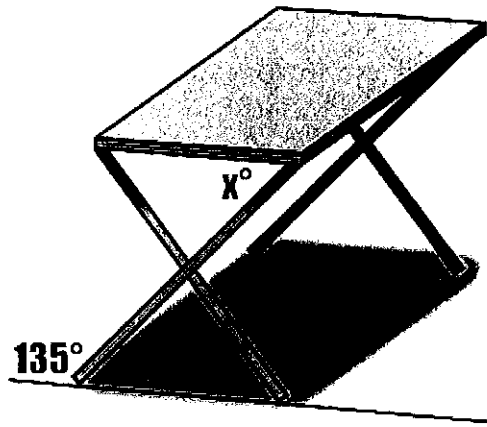


If line L is parallel to line M, what is true about angle ABC and angle DEF?



- A) They are obtuse.
- B) They are congruent.
- C) They are supplementary.
- D) They are complementary.

22)



A table makes the angle shown with the floor. What must be the value of x in order for the top of the table to be parallel with the ground?



- A) 30°
- B) 45°
- C) 55°
- D) 90°

23)

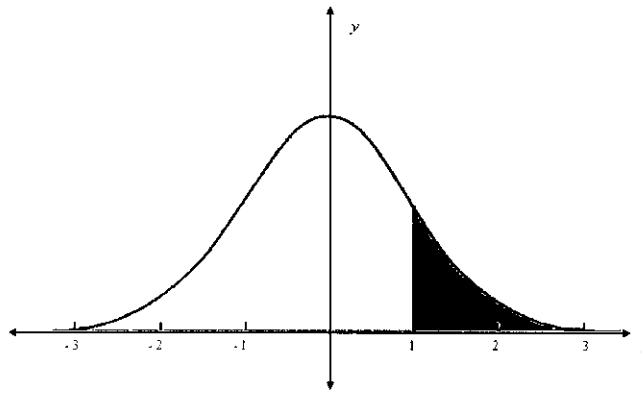
Ross needs to have a procedure done, and since he is over 65 he is on Medicare. Medicare says that according to their plan the allowed amount is $\frac{7}{8}$ of what the doctors office charges. Of that allowed amount they will pay $\frac{3}{4}$ and Ross will be out of pocket $\frac{1}{4}$.

If Ross had to pay \$262.50, how much did the office want to charge for the procedure?



- A) \$1,200
- B) \$3,000
- C) \$7,500
- D) \$8,000

24)

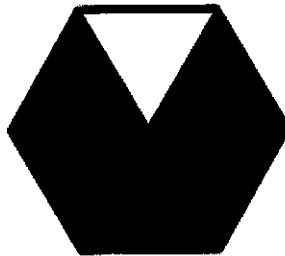


A point is randomly selected from the area under the curve. A reasonable value for the probability that the point lies in the black region is



- A) 0.19
- B) 0.49
- C) 0.79
- D) 0.99

25)



If a point is randomly chosen on the regular hexagon shown, what is the probability that it will be in a blue section of the figure?



- A) $\frac{1}{6}$
- B) $\frac{1}{3}$
- C) $\frac{1}{2}$
- D) $\frac{3}{4}$

26)

Equivalent Ratios

x y

6	9
?	12
10	15

What number is missing from the table of equivalent ratios?



- A) 4
- B) 6
- C) 8
- D) 9

27) Given side lengths 4 units, 8 units, and x units, determine the range in which x must lie in order for a triangle to exist.



- A) $x > 12$
- B) $0 < x < 4$
- C) $-4 < x < 0$
- D) $4 < x < 12$

28)

Time designing	Probability of return
1 - 2 hours	$\frac{5}{8}$
2 - 3 hours	$\frac{5}{9}$
3 - 4 hours	$\frac{7}{8}$
4 - 5 hours	$\frac{3}{4}$
5 - 6 hours	$\frac{1}{2}$
6 - 7 hours	$\frac{3}{7}$
7 - 8 hours	$\frac{2}{9}$

Julie designs gardens for a living. For a year she kept track of the amount of time she spent designing the garden and whether or not the customer returned. She recorded the time and probability that a customer returned.

To have the greatest probability of a returning customer, what amount of time should Julie spend per customer?



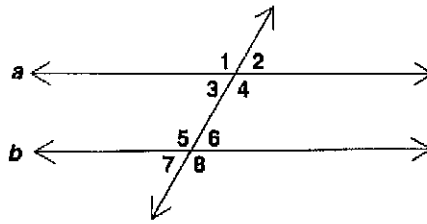
- A) 1 - 2 hours
- B) 2 - 3 hours
- C) 3 - 4 hours
- D) 4 - 5 hours

- 29) An orange can be separated into 8 sections. If 4 people eat 4 sections each, how many oranges will it take to feed them?



- A) 1 orange
- B) 2 oranges
- C) 4 oranges
- D) 8 oranges

30)



If lines a and b are parallel, which of the statements is true?



- A) $m\angle 1 \cong m\angle 6$
- B) $m\angle 1 \cong m\angle 7$
- C) $m\angle 1 \cong m\angle 8$
- D) $m\angle 3 \cong m\angle 5$

- 31) Cedric can buy 3 songs for \$3.60 or 4 songs for \$4.80. How much do you think he would pay for 5 songs?



- A) \$5.80
- B) \$6.00
- C) \$6.20
- D) \$6.40

- 32) Which type of triangle has side lengths of 2 in, 5 in, and 6 in?



- A) acute
- B) equilateral
- C) obtuse
- D) right

33) Brandon is baking cookies for a school bake sale. If he can make 2 dozen cookies in 23 minutes which is a reasonable estimate of the amount of time it will take him to make 12 dozen cookies?



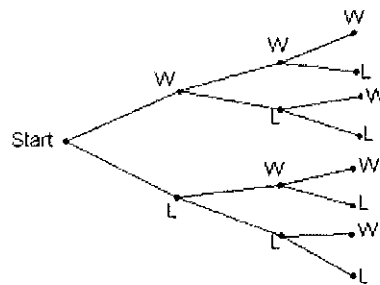
- A) between 4 and 5 hours
- B) between 3 and 4 hours
- C) between 2 and 3 hours
- D) between 1 and 2 hours

34) There are 4 portable classrooms at Glynn High School. Four teachers will be assigned to the rooms. In how many ways can these assignments be made?



- A) 12
- B) 16
- C) 20
- D) 24

35)



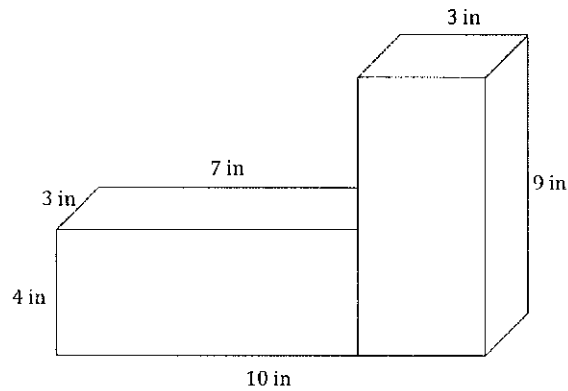
The tree diagram shows the possible win/loss paths for a basketball team playing in a tournament. Harris High School loses 1 game in the tournament. How many ways could this happen?



- A) 1

- B) 2
C) 3
D) 4

36)



Find the surface area of the figure.



- A) 162 in^2
B) 168 in^2
C) 189 in^2
D) 224 in^2

37)

Mark draws a card 50 times from a standard deck of 52 cards and gets a Heart 8 times. What is the experimental probability that he draws a Heart on his next draw?



- A) 2:13
B) 4:25
C) 1:4
D) 8:13

38)

24-7 Video Games takes a random survey of 500 site users and determines that the mean age of the sample is 18. Which conclusion is valid based on the random survey?



- A) Most users on all video game sites are exactly 18 years of age.
- B) Most users on the 24-7 Video Games site are about 18 years of age.
- C) Most users on the 24-7 Video Games site are 18 years of age or older.
- D) All users on the 24-7 Video Games site are 18 years of age or younger.

Grade My Test Now

or

Save For Me to Complete Later

[READ OUR BLOG](#)

[MEET OUR TEACHERS](#)

FOR TEACHERS, BY TEACHERS

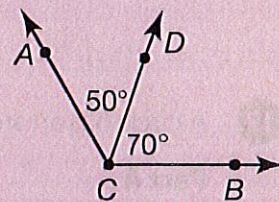
Angle Relationships

1 GETTING THE IDEA

Adjacent angles share a common vertex and a common ray. Adjacent angles do not overlap.

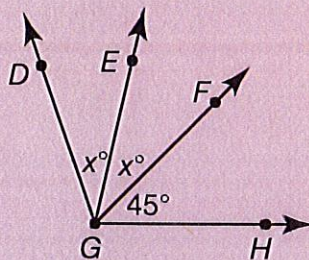
Angles ACD and DCB are adjacent angles. The measure of $\angle ACB$ is equal to the sum of the measures of the adjacent angles.

So, $m\angle ACB = 50^\circ + 70^\circ = 120^\circ$



Example 1

The measure of $\angle DGH$ is 109° . Find $m\angle DGE$.



Strategy Use what you know about adjacent angles to write and solve an equation for x .

Step 1 Write an equation.

The measure of angle DGH is equal to the sum of the measures of the three smaller, adjacent angles.

$$m\angle DGE + m\angle EGF + m\angle FGH = m\angle DGH$$

$$x + x + 45 = 109$$

Step 2 Solve the equation for x .

$$x + x + 45 = 109$$

$$2x + 45 = 109$$

$$2x = 64$$

$$x = 32$$

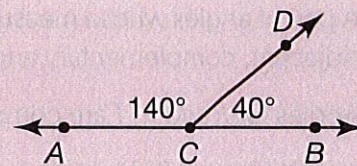
Solution The measure of $\angle DGE$ is 32° .

Two angles are **supplementary angles** if the sum of their measures is 180° . Adjacent supplementary angles form a straight line.

Angles ACD and DCB are supplementary angles.

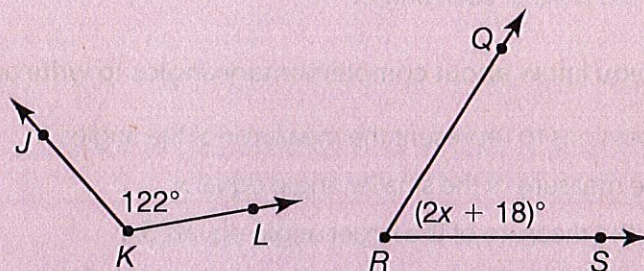
$$m\angle ACD + m\angle DCB = 180^\circ$$

Angles do not need to be adjacent in order to be supplementary.



Example 2

Angles JKL and QRS are supplementary. Find the value of x and the measure of $\angle QRS$.



Strategy Use what you know about supplementary angles to write and solve an equation for x .

Step 1 Write an equation.

The angles are supplementary. So, their sum is 180° .

Angle JKL measures 122° . Angle QRS measures $(2x + 18)^\circ$.

$$m\angle JKL + m\angle QRS = 180^\circ$$

$$122 + (2x + 18) = 180$$

Step 2 Solve the equation for x .

$$122 + (2x + 18) = 180$$

$$2x + (122 + 18) = 180$$

$$2x + 140 = 180$$

$$2x = 40$$

$$x = 20$$

Step 3 Find the measure of $\angle QRS$.

$$m\angle QRS = 2x + 18 = 2 \times 20 + 18 = 58^\circ$$

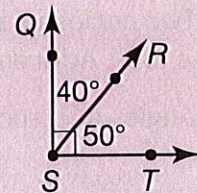
Solution The value of x is 20 and the measure of $\angle QRS$ is 58° .

A pair of angles whose measures have a sum of 90° are **complementary angles**.
Adjacent, complementary angles form a right angle.

Angles QSR and RST are complementary angles.

$$m\angle QSR + m\angle RST = 40^\circ + 50^\circ = 90^\circ$$

Complementary angles are not always adjacent.



Example 3

Two angles are complementary angles. The measure of the larger angle is 3 times the measure of the smaller angle. What is the measure of each angle?

Strategy Use what you know about complementary angles to write and solve an equation.

Step 1 Write expressions to represent the measures of the angles.
Let the measure of the smaller angle equal x .
Then, the measure of the larger angle equals $3x$.

Step 2 Write an equation.
The angles are complementary, so their sum is 90° .
 $3x + x = 90$

Step 3 Solve the equation for x .
 $3x + x = 90$
 $4x = 90$
 $x = 22.5$

Step 4 Find the measure of each angle.
Measure of the smaller angle: $x = 22.5^\circ$.
Measure of the larger angle: $3x = 3 \times 22.5 = 67.5^\circ$.

Solution The measures of the angles are 22.5° and 67.5° .

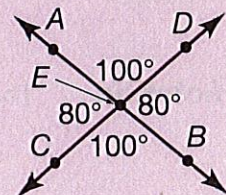
Vertical angles are formed by intersecting lines and are opposite one another. They share a vertex, which is their only common point. Vertical angles have the same measure.

Angles AED and CEB are vertical angles.

$$m\angle AED = m\angle CEB$$

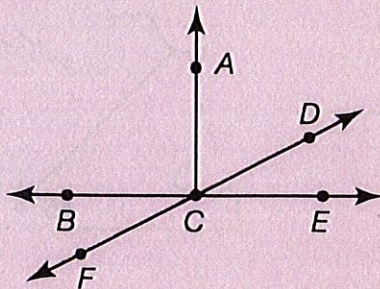
Angles AEC and DEB are vertical angles.

$$m\angle AEC = m\angle DEB$$



Example 4

The measure of $\angle ACD$ is $(10x + 3)^\circ$ and $m\angle BCF = 27^\circ$. Angles ACD and DCE are complementary. What is the value of x and the measure of $\angle ACD$?



Strategy Use what you know about angles to write and solve an equation.

Step 1 Identify the relationships between the angles.

Angles ACD and DCE are complementary. The sum of their measures is 90° .

Angles BCF and DCE are vertical angles. They are congruent.

Since $m\angle BCF = 27^\circ$, $m\angle DCE = 27^\circ$.

Step 2 Write an equation to find the value of x .

$$m\angle ACD + m\angle DCE = 90^\circ$$

$$(10x + 3) + 27 = 90$$

Step 3 Solve the equation for x .

$$10x + 3 + 27 = 90$$

$$10x + 30 = 90$$

$$10x = 60$$

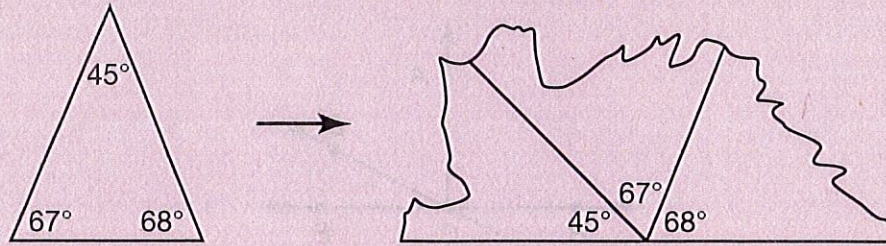
$$x = 6$$

Step 4 Find the measure of $\angle ACD$.

$$m\angle ACD = 10x + 3 = 10 \times 6 + 3 = 63^\circ$$

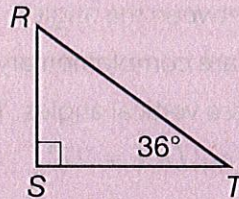
Solution The value of x is 6 and the measure of $\angle ACD$ is 63° .

The drawing below shows that if you place the three **interior angles** of a triangle adjacent to each other, they form a straight line. The sum of the measures of the adjacent angles is equal to 180° , so the sum of the measures of the interior angles of a triangle is 180° .



Example 5

$\triangle RST$ is a right triangle. Find $m\angle R$.



Strategy Write and solve an equation.

Step 1 Identify the measures of the given angles.

$$\begin{aligned}\angle S \text{ is a right angle, so } m\angle S &= 90^\circ \\ m\angle T &= 36^\circ\end{aligned}$$

Step 2 Write an equation. Substitute the measures of the given angles.

$$\begin{aligned}m\angle R + m\angle S + m\angle T &= 180^\circ \\ m\angle R + 90^\circ + 36^\circ &= 180^\circ\end{aligned}$$

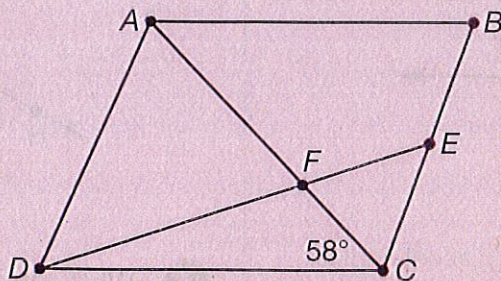
Step 3 Solve the equation for $m\angle R$.

$$\begin{aligned}m\angle R + 90^\circ + 36^\circ &= 180^\circ && \text{Add like terms.} \\ m\angle R + 126^\circ &= 180^\circ && \text{Subtract } 126^\circ \text{ from both sides.} \\ m\angle R + 126^\circ - 126^\circ &= 180^\circ - 126^\circ \\ m\angle R &= 54^\circ\end{aligned}$$

Solution The measure of $\angle R$ is 54° .

COACHED EXAMPLE

An architect designs two walking paths across a flower garden. The paths are shown by \overline{AC} and \overline{DE} . In her design, the measure of $\angle ECF$ is the same as the measure of $\angle EFC$. She draws $\angle DCF$ so that it measures 58° . She draws $\angle DCE$ so that it measures 110° . What is the measure of $\angle AFD$ in her design?



Angles DCF and ECF are _____ angles.

Write an equation to represent the sum of the measures of their angles. Then solve for x .

$$m\angle DCF + m\angle ECF = m\angle \underline{\hspace{2cm}}$$

$$\underline{\hspace{2cm}} + x = 110$$

$$x = \underline{\hspace{2cm}}$$

So, $m\angle ECF = \underline{\hspace{2cm}}^\circ$.

Since $m\angle ECF = m\angle EFC$, $m\angle EFC = \underline{\hspace{2cm}}^\circ$.

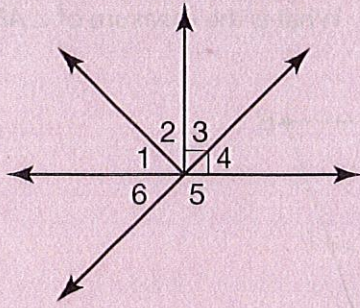
Angles EFC and AFD are _____ angles, so their measures are _____.

Therefore, $m\angle AFD = \underline{\hspace{2cm}}^\circ$.

The measure of $\angle AFD$ is _____ $^\circ$ in her design.

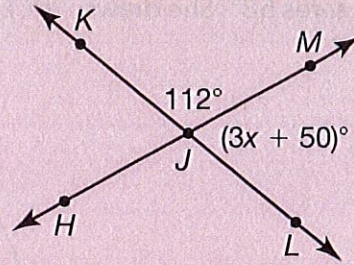
3 LESSON PRACTICE

- 1 Which statement is **not** true?



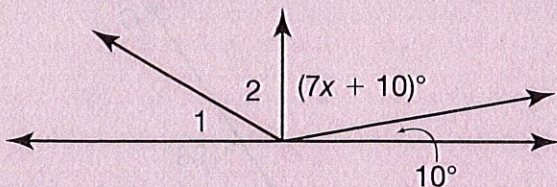
- A. Angles 1 and 2 are adjacent angles.
 B. Angles 3 and 4 are complementary angles.
 C. $m\angle 5 + m\angle 6 = 180^\circ$
 D. Angles 3 and 6 are vertical angles.
- 2 Two angles are complementary. The measure of the larger angle is twice the measure of the smaller angle. What is the measure of the larger angle?
- A. 30°
 B. 60°
 C. 90°
 D. 120°
- 3 In $\triangle ABC$, $m\angle A = 90^\circ$ and $m\angle C = 22^\circ$. What is the measure of $\angle B$?
- A. 22°
 B. 54°
 C. 68°
 D. 112°

Use the figure below for questions 4 and 5.

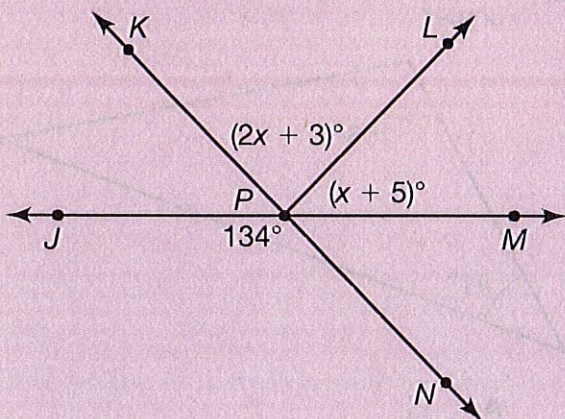


- 4 What is the measure of $\angle HJL$?
- A. 18°
 B. 68°
 C. 72°
 D. 112°
- 5 What is the value of x ?
- A. 6
 B. 9
 C. 18
 D. 68
- 6 Two angles are supplementary. The measure of the larger angle is 4 times the measure of the smaller angle. What is the measure of the smaller angle?
- A. 18°
 B. 36°
 C. 45°
 D. 144°

- 7 Angles 1 and 2 are complementary angles. What is the value of x ?



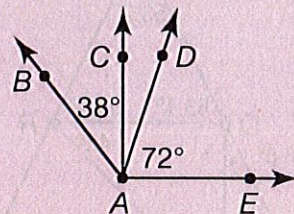
- A. 10
 B. 11.4
 C. 20
 D. 22.6
- 8 Angles JPK and JPN are supplementary. What is the value of x ?



- A. 66.5
 B. 63
 C. 46
 D. 42

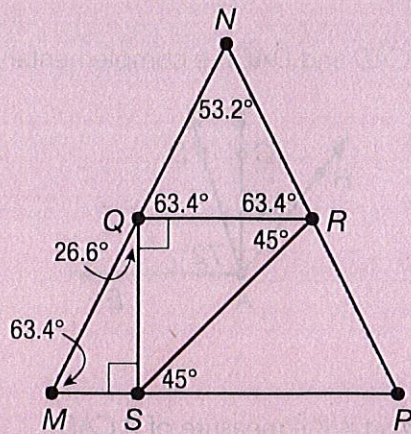
Use the figure below for questions 9 and 10.

Angles CAD and DAE are complementary.



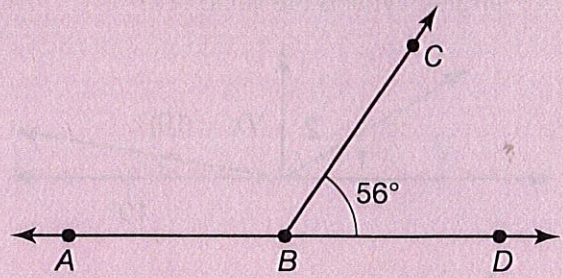
- 9 What is the measure of $\angle CAD$?
- A. 12°
 B. 18°
 C. 34°
 D. 38°
- 10 What is the measure of $\angle BAE$?
- A. 34°
 B. 110°
 C. 112°
 D. 128°
- 11 In $\triangle ABC$, $m\angle A = 55^\circ$ and $m\angle B = 72^\circ$. What is the measure of $\angle C$?
- A. 35°
 B. 37°
 C. 53°
 D. 127°

Use the figure below for questions 12–14.



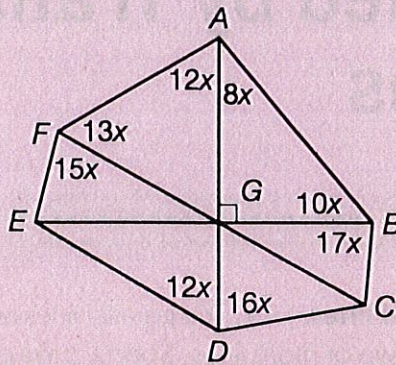
- 12** Which term accurately describes $\angle NQR$ and $\angle NMP$?
- A. adjacent angles
 - B. complementary angles
 - C. supplementary angles
 - D. congruent angles
- 13** Which term accurately describes $\angle MQS$ and $\angle QMS$?
- A. complementary angles
 - B. adjacent angles
 - C. congruent angles
 - D. supplementary angles
- 14** What is the measure of $\angle SRP$?
- A. 45°
 - B. 71.6°
 - C. 82.6°
 - D. 90°

- 15** What is the measure of $\angle ABC$?



- A. 124°
 - B. 112°
 - C. 62°
 - D. 56°
- 16** What is the measure of the unlabeled angle?
-
- A. 21°
 - B. 31°
 - C. 41°
 - D. 108°
- 17** Angles ABC and DBE are vertical angles. If $m\angle ABC = 52^\circ$, what is $m\angle DBE$?
- A. 38°
 - B. 52°
 - C. 128°
 - D. 180°

- 18 Polygon $ABCDEF$ is shown below. \overline{FC} , \overline{AD} , and \overline{EB} are line segments.

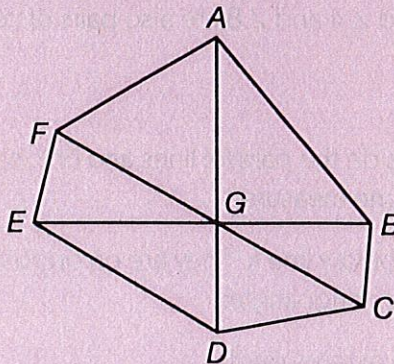


Part A

What is the value of x ? Explain or show all your work.

Part B

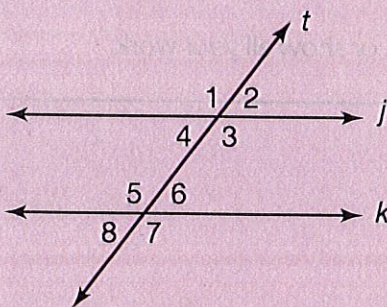
Write the measure of each angle in polygon $ABCDEF$ in the figure below.



Angles Formed by Transversals of Parallel Lines

1 GETTING THE IDEA

The figure below shows two **parallel lines**, $j \parallel k$. The parallel lines are intersected by a **transversal**, t . A transversal is a line that intersects two or more lines. Special pairs of angles are formed when a transversal intersects two parallel lines.



Corresponding Angles

Corresponding angles are on the same side of the transversal and on the same side of the parallel lines. In other words, corresponding angles lie in the same position relative to the points of intersection. Corresponding angles have the same measure.

- $\angle 1$ is in the upper left section of the intersection of lines j and t . $\angle 5$ is in the upper left section of the intersection of lines k and t , so $\angle 1$ and $\angle 5$ are corresponding angles.
- $\angle 2$ and $\angle 6$, $\angle 3$ and $\angle 7$, and $\angle 4$ and $\angle 8$ are also pairs of corresponding angles.

Alternate Exterior Angles

Alternate exterior angles are outside the parallel lines and on opposite sides of the transversal. Alternate exterior angles have the same measure.

- $\angle 2$ is above line j and $\angle 8$ is below line k . They are on opposite sides of the transversal, so $\angle 2$ and $\angle 8$ are alternate exterior angles.
- $\angle 1$ and $\angle 7$ are also alternate exterior angles.

Alternate Interior Angles

Alternate interior angles are on the inside of the parallel lines and are on opposite sides of the transversal. Alternate interior angles have the same measure.

- $\angle 3$ is below line j and $\angle 5$ is above line k . The angles are on opposite sides of the transversal, so $\angle 3$ and $\angle 5$ are alternate interior angles.
- $\angle 4$ and $\angle 6$ are also alternate interior angles.

Vertical Angles

Vertical angles are opposite angles formed by two intersecting lines. Vertical angles have the same measure.

- $\angle 2$ and $\angle 4$ are both formed by the intersection of line j and line t . The angles are opposite of each other, so $\angle 2$ and $\angle 4$ are vertical angles.
- $\angle 1$ and $\angle 3$, $\angle 6$ and $\angle 8$, and $\angle 5$ and $\angle 7$ are also vertical angles.

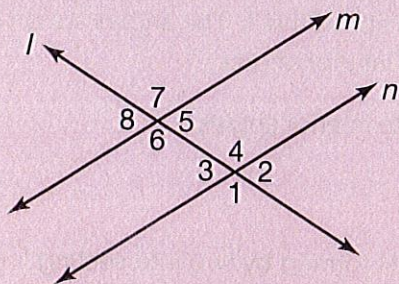
Same-Side Interior Angles

Same-side interior angles are between parallel lines and on the same side of the transversal. Same-side interior angles are supplementary angles. The measures of supplementary angles add to 180° .

- $\angle 3$ and $\angle 6$ are between the lines and to the right of the transversal, so $\angle 3$ and $\angle 6$ are same-side interior angles.
- $\angle 4$ and $\angle 5$ are also same-side interior angles.

Example 1

Line $m \parallel n$, and intersected by transversal l . Identify all pairs of corresponding angles, alternate exterior angles, vertical angles, alternate interior angles, and same-side interior angles in the figure below.



Strategy Use the definitions to find all of the pairs of angles.

Step 1

Find all of the pairs of corresponding angles.

$\angle 8$ and $\angle 3$ lie in the same position compared to the points of intersection. So do $\angle 7$ and $\angle 4$, $\angle 6$ and $\angle 1$, and $\angle 5$ and $\angle 2$.

Step 2

Find all of the pairs of alternate exterior angles.

$\angle 8$, $\angle 7$, $\angle 2$, and $\angle 1$ are outside the 2 lines.
 $\angle 7$ and $\angle 1$ are on opposite sides of the transversal.
 $\angle 8$ and $\angle 2$ are on opposite sides of the transversal.

Step 3

Find all of the pairs of vertical angles.

$\angle 1$, $\angle 2$, $\angle 3$, and $\angle 4$ are formed by the intersection of lines n and l .
 $\angle 1$ and $\angle 4$, and $\angle 2$ and $\angle 3$ are pairs of vertical angles.
 $\angle 5$, $\angle 6$, $\angle 7$, and $\angle 8$ are formed by the intersection of lines m and l .
 $\angle 6$ and $\angle 7$, and $\angle 5$ and $\angle 8$ are pairs of vertical angles.

Step 4

Find all of the pairs of alternate interior angles.

$\angle 3$, $\angle 4$, $\angle 5$, and $\angle 6$ are between the lines.
 $\angle 4$ and $\angle 6$ are on opposite sides of the transversal.
 $\angle 3$ and $\angle 5$ are on opposite sides of the transversal.

Step 5

Find all of the pairs of same-side interior angles.

$\angle 3$, $\angle 4$, $\angle 5$, and $\angle 6$ are between the lines.
 $\angle 3$ and $\angle 6$ are on the same side of the transversal.
 $\angle 4$ and $\angle 5$ are on the same side of the transversal.

Solution

The pairs of angles can be identified as follows:

corresponding angles: $\angle 2$ and $\angle 5$; $\angle 1$ and $\angle 6$; $\angle 4$ and $\angle 7$; $\angle 3$ and $\angle 8$

alternate exterior angles: $\angle 1$ and $\angle 7$; $\angle 2$ and $\angle 8$

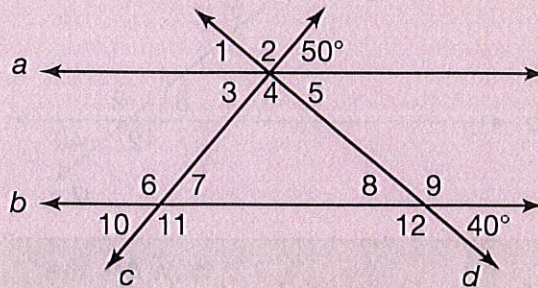
vertical angles: $\angle 1$ and $\angle 4$; $\angle 2$ and $\angle 3$; $\angle 6$ and $\angle 7$; $\angle 5$ and $\angle 8$

alternate interior angles: $\angle 4$ and $\angle 6$; $\angle 3$ and $\angle 5$

same-side interior angles: $\angle 3$ and $\angle 6$; $\angle 4$ and $\angle 5$

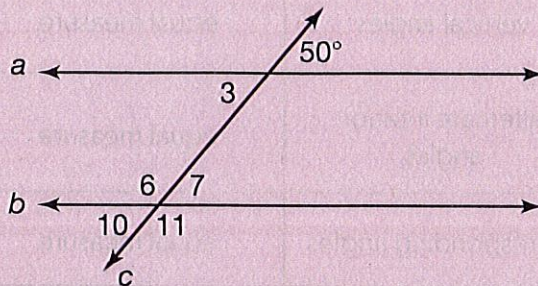
Example 2

In the figure below, $a \parallel b$, and both lines are cut by transversals c and d . What are the missing angle measures in the figure?



Strategy Break the figure into sections based upon transversals.

Step 1 Focus on the angles formed by parallel lines a and b that are cut by transversal line c .

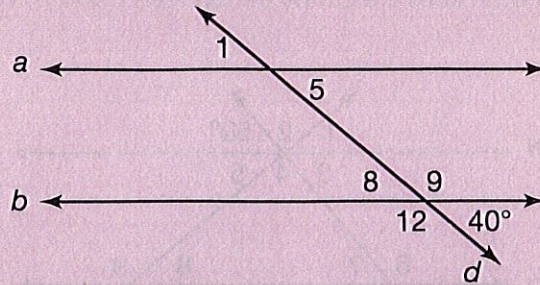


Create a table to help organize your work.

Angle Pair	Classification	How Are the Measures Related When Lines Are Parallel?	What Can I Figure Out?
$\angle 3$ and the angle marked 50°	vertical angles	equal measure	$m\angle 3 = 50^\circ$
$\angle 3$ and $\angle 7$	alternate interior angles	equal measure	$m\angle 7 = 50^\circ$
$\angle 3$ and $\angle 10$	corresponding angles	equal measure	$m\angle 10 = 50^\circ$
$\angle 3$ and $\angle 6$	same-side interior angles	sum to 180°	$m\angle 3 + m\angle 6 = 180^\circ$ $50^\circ + m\angle 6 = 180^\circ$ $m\angle 6 = 130^\circ$
$\angle 6$ and $\angle 11$	vertical angles	equal measure	$m\angle 11 = 130^\circ$

Step 2

Focus on the angles formed by parallel lines a and b , cut by transversal line d .



Angle Pair	Classification	How Are the Measures Related When Lines Are Parallel?	What Can I Figure Out?
$\angle 8$ and the angle marked 40°	vertical angles	equal measure	$m\angle 8 = 40^\circ$
$\angle 5$ and $\angle 8$	alternate interior angles	equal measure	$m\angle 5 = 40^\circ$
$\angle 1$ and $\angle 8$	corresponding angles	equal measure	$m\angle 1 = 40^\circ$
$\angle 9$ and $\angle 5$	same-side interior angles	sum to 180°	$m\angle 9 + m\angle 5 = 180^\circ$ $m\angle 9 + 40^\circ = 180^\circ$ $m\angle 9 = 140^\circ$
$\angle 9$ and $\angle 12$	vertical angles	equal measure	$m\angle 12 = 140^\circ$

Step 3

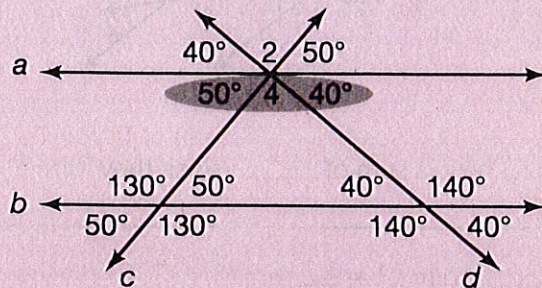
Fill in the known angle measures in the figure. Use this information to find the measures of the remaining angles.

The three angles below line a form a straight line, so they have a sum of 180° .

$$50^\circ + 40^\circ + m\angle 4 = 180^\circ$$

$$90^\circ + m\angle 4 = 180^\circ$$

$$m\angle 4 = 90^\circ$$



$\angle 2$ and $\angle 4$ are vertical angles, so $m\angle 2 = 90^\circ$.

Solution

$$m\angle 1 = m\angle 5 = m\angle 8 = 40^\circ$$

$$m\angle 2 = m\angle 4 = 90^\circ$$

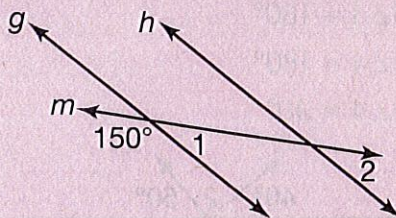
$$m\angle 3 = m\angle 7 = m\angle 10 = 50^\circ$$

$$m\angle 6 = m\angle 11 = 130^\circ$$

$$m\angle 9 = m\angle 12 = 140^\circ$$

2 COACHED EXAMPLE

In the figure below, lines g and h are parallel and cut by transversal m . What is the measure of $\angle 2$?



The angle marked 150° and $m\angle 1$ have a sum of _____ since they form a _____.

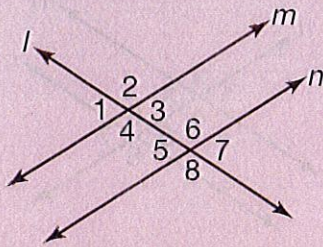
Therefore, $150^\circ + m\angle 1 = \underline{\hspace{2cm}}$, so $m\angle 1 = \underline{\hspace{2cm}}$.

Since line g and line h are _____, $\angle 1$ and $\angle 2$ are _____ angles and the measures of $\angle 1$ and $\angle 2$ are _____.

$m\angle 2 = \underline{\hspace{2cm}}$

3 LESSON PRACTICE

Use the figure below for questions 1–3. Lines m and n are parallel and are intersected by transversal l . No angle is a right angle.

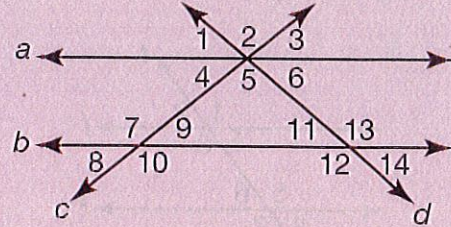


- 1 Which angle forms a pair of alternate interior angles with $\angle 5$?
 - A. $\angle 3$
 - B. $\angle 4$
 - C. $\angle 7$
 - D. $\angle 8$

- 2 Which angles have the same measure?
 - A. $\angle 1$ and $\angle 6$
 - B. $\angle 4$ and $\angle 6$
 - C. $\angle 5$ and $\angle 8$
 - D. $\angle 5$ and $\angle 4$

- 3 Which angles do **not** have the same measure?
 - A. $\angle 5$ and $\angle 7$
 - B. $\angle 4$ and $\angle 2$
 - C. $\angle 1$ and $\angle 7$
 - D. $\angle 4$ and $\angle 3$

Use the figure below for questions 4–6. Lines a and b are parallel and are intersected by transversals c and d .

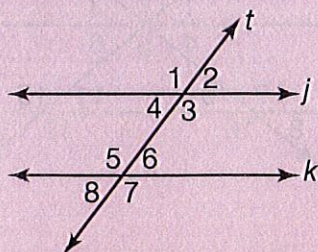


- 4 Which correctly describes the relationship between $\angle 11$ and $\angle 6$?
 - A. corresponding angles
 - B. vertical angles
 - C. alternate interior angles
 - D. alternate exterior angles

- 5 Which correctly describes the relationship between $\angle 7$ and $\angle 9$?
 - A. corresponding angles
 - B. same-side interior angles
 - C. supplementary angles
 - D. vertical angles

- 6 Which correctly describes the relationship between $\angle 1$ and $\angle 14$?
 - A. alternate interior angles
 - B. alternate exterior angles
 - C. corresponding angles
 - D. same-side interior angles

Use the figure below for questions 7 and 8. Lines j and k are parallel and are intersected by transversal t . No angle is a right angle.



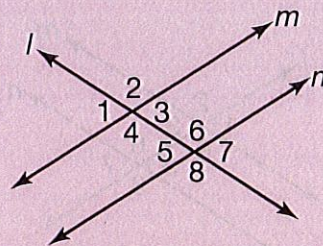
7 Which of the following statements is true?

- A. $\angle 1$ and $\angle 3$ are vertical angles and alternate interior angles.
- B. $\angle 4$ and $\angle 6$ are alternate interior angles and supplementary angles.
- C. $\angle 4$ and $\angle 6$ are alternate interior angles and have the same measure.
- D. $\angle 7$ and $\angle 2$ are corresponding angles and have the same measure.

8 Suppose that t is moved so that the measure of $\angle 2$ increases. Which of the following is true?

- A. The measure of $\angle 1$ will stay the same.
- B. The measure of $\angle 5$ will increase.
- C. The measure of $\angle 7$ will increase.
- D. The measure of $\angle 4$ will increase.

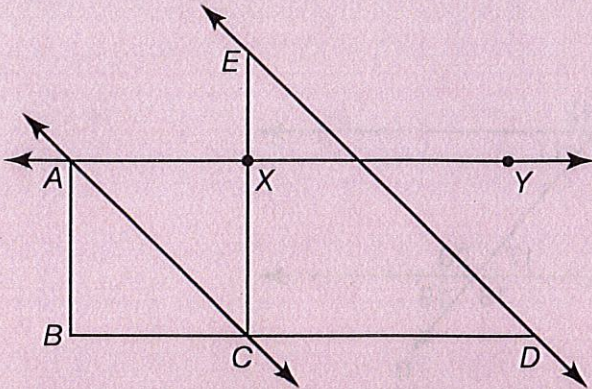
9 Lines m and n are parallel and are intersected by transversal l . Suppose that line l is moved so that $\angle 2$ becomes a right angle.



Which of the following is a reasonable argument?

- A. If $\angle 2$ is a right angle, then $\angle 4$ is also a right angle (vertical angles). Since $\angle 4$ and $\angle 6$ are alternate interior angles and lines m and n are parallel, then $\angle 6$ is a right angle. Thus, n and l are perpendicular lines.
- B. If $\angle 2$ is a right angle, then $\angle 4$ is also a right angle (vertical angles). Since $\angle 4$ and $\angle 6$ are alternate exterior angles and lines m and n are parallel, $\angle 6$ is a right angle. This implies that lines n and l are perpendicular.
- C. If $\angle 2$ is a right angle, then $\angle 4$ is also a right angle (vertical angles). Since $\angle 4$ and $\angle 6$ are alternate interior angles and lines m and n are parallel, $\angle 6$ is a right angle. This implies that lines n and l are not perpendicular.
- D. If $\angle 2$ is a right angle, then $\angle 4$ is also a right angle (vertical angles). Since $\angle 4$ and $\angle 3$ are supplementary angles, $\angle 3$ is also a right angle. This implies that lines n and l are perpendicular.

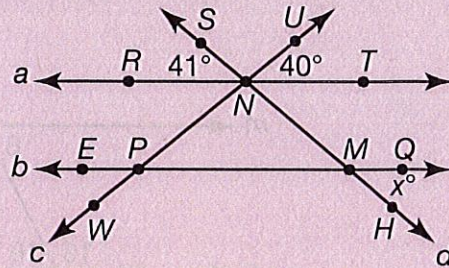
- 10 In the figure below, $\vec{AC} \parallel \vec{ED}$, $\overline{AB} \parallel \overline{XC}$, and $\angle ABC$ is a right angle.



Which of the following is **not** correct?

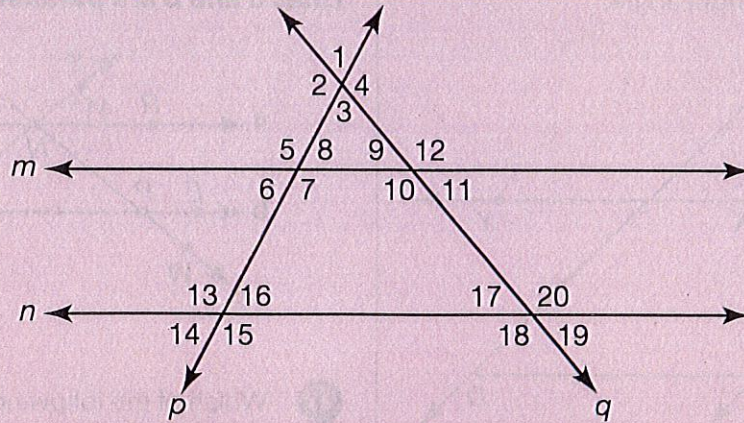
- A. Since $\vec{AC} \parallel \vec{ED}$, $\angle CED$ and $\angle ACE$ have the same measure because they are alternate interior angles formed by \overline{EC} intersecting \vec{AC} and \vec{ED} .
- B. Since $\vec{AC} \parallel \vec{ED}$, $\angle CED$ and $\angle ACE$ have the same measure because they are corresponding angles formed by \overline{EC} intersecting \vec{AC} and \vec{ED} .
- C. Since $\overline{AB} \parallel \overline{XC}$, $\angle ABC$ and $\angle XCD$ have the same measure because they are corresponding angles formed by \overline{BC} intersecting \overline{AB} and \overline{XC} . So, $\angle XCD$ is also a right angle.
- D. Since $\overline{AB} \parallel \overline{XC}$, $\angle XCA$ and $\angle BAC$ have the same measure because they are alternate interior angles formed by \overline{AC} intersecting \overline{AB} and \overline{XC} .

Use the figure below for questions 11–13. Lines a and b are parallel.



- 11 Which of the following is true?
- A. $m\angle EPW = 40.5^\circ$
- B. $m\angle EPW = 41^\circ$
- C. $m\angle EPW = 40^\circ$
- D. $m\angle EPW = 138^\circ$
- 12 What is the value of x ?
- A. 40
- B. 41
- C. 99
- D. 139
- 13 Which of the following is **not** true?
- A. $m\angle RNP = 40^\circ$
- B. $m\angle RNM = 139^\circ$
- C. $m\angle PNM = 99^\circ$
- D. $m\angle PNT = 139^\circ$

- 14 In the figure below line $m \parallel$ line n .



Part A

Which angles in the figure are **not** formed by a transversal intersecting a pair of parallel lines?

Part B

$m\angle 1$ is 65° and $m\angle 5$ is 117° . What are the measures of the remaining angles in the figure? For each angle measure, name the relationship you used to find it.

$m\angle 1 =$	$m\angle 11 =$
$m\angle 2 =$	$m\angle 12 =$
$m\angle 3 =$	$m\angle 13 =$
$m\angle 4 =$	$m\angle 14 =$
$m\angle 5 =$	$m\angle 15 =$
$m\angle 6 =$	$m\angle 16 =$
$m\angle 7 =$	$m\angle 17 =$
$m\angle 8 =$	$m\angle 18 =$
$m\angle 9 =$	$m\angle 19 =$
$m\angle 10 =$	$m\angle 20 =$