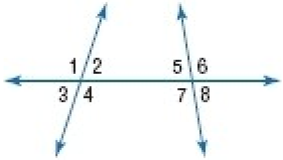
Practice Test - Chapter 3

Classify the relationship between each pair of angles as *alternate interior, alternate exterior, corresponding,* or *consecutive interior angles*.



1. $\angle 6$ and $\angle 3$

SOLUTION:
Angles 6 and 3 are nonadjacent exterior angles that lie on opposite sides of the transversal. They are alternate exterior angles.

ANSWER:
alternate exterior

2. $\angle 4$ and $\angle 7$

SOLUTION:
Angles 4 and 7 are interior angles that lie on the same side of the transversal. They are consecutive interior angles.

ANSWER:
consecutive interior

3. $\angle 5$ and $\angle 4$

SOLUTION:
Angles 5 and 4 are nonadjacent interior angles that lie on opposite sides of the transversal. They are alternate interior angles.

ANSWER:
alternate interior

Determine the slope of the line that contains the given points.

4. $G(8, 1)$, $H(8, –6)$

SOLUTION:
The coordinates of the point G is (8, 1) and that of H is (8, –6). Substitute the values in the slope formula.

$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{-6-1}{8-8} \\ &= \frac{-7}{0} \text{ (undefined)} \end{aligned}$$

So, the slope is undefined.

ANSWER:
undefined

5. $A(0, 6)$, $B(4, 0)$

SOLUTION:

The coordinates of the point A is (0, 6) and that of B is (4, 0). Substitute the values in the slope formula.

$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{0-6}{4-0} \\ &= \frac{-6}{4} \\ &= -\frac{3}{2} \end{aligned}$$

Therefore, the slope of the line is $-\frac{3}{2}$.

ANSWER:

$-\frac{3}{2}$

6. $E(6, 3)$, $F(–6, 3)$

SOLUTION:

The coordinates of the point E is (6, 3) and that of F is (–6, 3). Substitute the values in the slope formula.

$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{3-3}{-6-6} \\ &= -\frac{0}{12} \\ &= 0 \end{aligned}$$

Therefore, the slope of the line is 0.

ANSWER:

0

7. $E(5, 4)$, $F(8, 1)$

SOLUTION:

The coordinates of the point E is (5, 4) and that of F *is* (8, 1). Substitute the values in the slope formula.

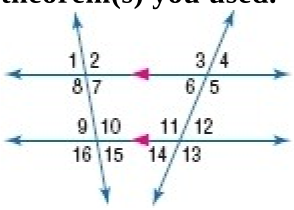
$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{1-4}{8-5} \\ &= -\frac{3}{3} \\ &= -1 \end{aligned}$$

Therefore, the slope of the line is -1.

ANSWER:

–1

In the figure, $m\angle 8 = 96$ and $m\angle 12 = 42$. Find the measure of each angle. Tell which postulate(s) or theorem(s) you used.



8. $\angle 9$

SOLUTION:

In the figure, angles 8 and 9 are consecutive interior angles.
By the consecutive interior angles theorem, $m\angle 8 + m\angle 9 = 180$.
Substitute $m\angle 8 = 96$.

$$\begin{aligned} 96 + m\angle 9 &= 180 \\ m\angle 9 &= 84 \end{aligned}$$

ANSWER:

84; Consecutive Interior Angles Thm.

9. $\angle 11$

SOLUTION:

By the Supplementary angles theorem, $m\angle 11 + m\angle 12 = 180$.
Substitute.

$$\begin{aligned} m\angle 11 + 42 &= 180 \\ m\angle 11 + 42 - 42 &= 180 - 42 \\ m\angle 11 &= 138 \end{aligned}$$

ANSWER:

138; Supplementary Angles Thm.

10. $\angle 6$

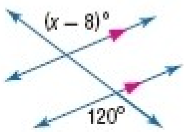
SOLUTION:

By the Alternate Interior Angles Theorem, $\angle 6 \cong \angle 12$.
So, $m\angle 6 = 42$.

ANSWER:

42; Alternate Interior Angles Thm.

11. Find the value of the variable in the figure below.



SOLUTION:

The angles (*x* – 8)° and 120° are alternate exterior angles and hence they are congruent.

$$x - 8 = 120$$
$$x = 128$$

ANSWER:

128

12. **FITNESS** You would like to join a fitness center. Fit-N-Trim charges $80 per month. Fit-For-Life charges a one-time membership fee of $75 and $55 per month.

a. Write and graph two equations in slope-intercept form to represent the cost y to attend each fitness center for x months.

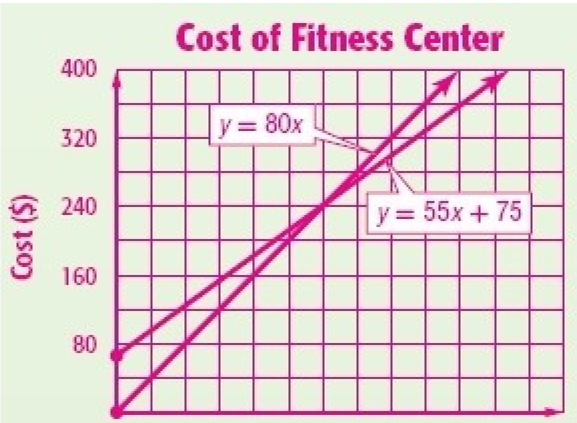
b. Are the lines you graphed in part a parallel? Explain why or why not.

c. Which fitness center offers the better rate? Explain.

SOLUTION:

a. The Fit-N-Trim plan has a monthly charge of $80 per month. So, if y is the total charge and x is the monthly charge then the equation is $y = 80x$.

The Fit-For-Life plan has a monthly charge of $55 and additional cost of $75. So, if y is the total charge and x is the monthly charge then the equation is $y = 55x + 75$.

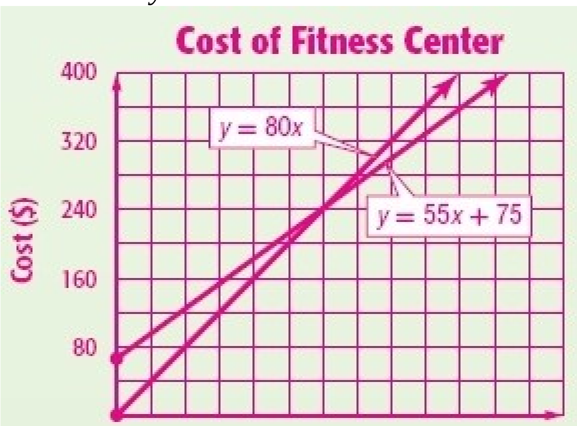


b. No; the lines intersect because the slopes of the two lines, 80 and 55, are not equal.

c. From the graph, it appears that if you attend the center for less than 3 month, Fit-N-Trim offers the lower rate. If you intend to attend for more than 3 months, Fit-For-Life offers the better rate.

ANSWER:

a. Fit-N-Trim: $y = 80x$,
Fit-For-Life: $y = 55x + 75$



b. No; the lines intersect because the slopes of the two lines, 80 and 55, are not equal.

c. From the graph, it appears that if you attend the center for less than 3 month, Fit-N-Trim offers the lower rate. If you intend to attend for more than 3 months, Fit-For-Life offers the better rate.

Write an equation in slope-intercept form for each line described.

13. passes through (–8, 1), perpendicular to $y = 2x - 17$

SOLUTION:

The slope of the line $y = 2x - 17$ is 2. So, the slope of the line perpendicular to the given line is $-\frac{1}{2}$.

Use the slope and the point to write the equation of the line in point-slope form.

The point-slope form of a line is $y - y_1 = m(x - x_1)$ where m is the slope and (x_1, y_1) is a point on the line.

Here, $m = -\frac{1}{2}$ and $(x_1, y_1) = (-8, 1)$.

So, the equation of the line is

$$\begin{aligned} y - 1 &= -\frac{1}{2}(x - (-8)) \\ y - 1 &= -\frac{1}{2}(x + 8) \\ y - 1 &= -\frac{1}{2}x - 4 \\ y - 1 + 1 &= -\frac{1}{2}x - 4 + 1 \\ y &= -\frac{1}{2}x - 3 \end{aligned}$$

ANSWER:

$y = -\frac{1}{2}x - 3$

14. passes through (0, 7), parallel to $y = 4x - 19$

SOLUTION:

The slope of the line $y = 4x - 19$ is 4. So, the slope of the line parallel to the given line is also 4.

Use the slope and the point to write the equation of the line in point-slope form.

The point-slope form of a line is $y - y_1 = m(x - x_1)$ where m is the slope and (x_1, y_1) is a point on the line.

Here, $m = 4$ and $(x_1, y_1) = (0, 7)$.

$$\begin{aligned} y - 7 &= 4(x - 0) \\ y - 7 &= 4x \\ y &= 4x + 7 \end{aligned}$$

ANSWER:

$y = 4x + 7$

15. passes through (–12, 3), perpendicular to $y=-\frac{2}{3}x-11$

SOLUTION:

The slope of the line $y=-\frac{2}{3}x-11$ is $-\frac{2}{3}$. So, the slope of the line perpendicular to the given line is $\frac{3}{2}$.

Use the slope and the point to write the equation of the line in point-slope form.

The point-slope form of a line is $y - y_1 = m(x - x_1)$ where m is the slope and (x_1, y_1) is a point on the line.

Here, $m=\frac{3}{2}$ and $(x_1, y_1) = (–12, 3)$.

$$\begin{aligned} y-3 &= \frac{3}{2}\left(x-(-12)\right) \\ y-3 &= \frac{3}{2}(x+12) \\ y-3 &= \frac{3}{2}x+18 \\ y-3+3 &= \frac{3}{2}x+18+3 \\ y &= \frac{3}{2}x+21 \end{aligned}$$

ANSWER:

$y=\frac{3}{2}x+21$

Find the distance between each pair of parallel lines with the given equations.

16. $y = x - 11$
$y = x - 7$

SOLUTION:

The slope of a line perpendicular to both the lines will be –1. Consider the y-intercept of any of the two lines and write the equation of the perpendicular line through it. The y-intercept of the line $y = x - 7$ is (0, –7). So, the equation of a line with slope –1 and a y-intercept of –7 is $y = -x - 7$.

To find the point of intersection of the perpendicular and the second line, solve the two equations.
The left sides of the equations are the same. So, equate the right sides and solve for x.

$$\begin{aligned} x - 11 &= -x - 7 \\ 2x &= 4 \\ x &= 2 \end{aligned}$$

Use the value of x to find the value of y.

$$\begin{aligned} y &= x - 11 \\ &= 2 - 11 \\ &= -9 \end{aligned}$$

So, the point of intersection is (2, –9).

Use the Distance Formula to find the distance between the points (2, –9) and (0, –7).

$$\begin{aligned} d &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\ &= \sqrt{(0 - 2)^2 + (-7 + 9)^2} \\ &= \sqrt{4 + 4} \\ &= \sqrt{8} \\ &\approx 2.8 \end{aligned}$$

Therefore, the distance between the two lines is $\sqrt{8}$ units.

ANSWER:

$\sqrt{8} \approx 2.8$

17. $y=-2x+1$
$y=-2x+16$

SOLUTION:

The slope of a line perpendicular to both the lines will be $\frac{1}{2}$. Consider the y-intercept of any of the two lines and write the equation of the perpendicular line through it.

The y-intercept of the line $y=-2x+16$ is (0, 16). So, the equation of a line with slope $\frac{1}{2}$ and a y-intercept of 16 is $y=\frac{1}{2}x+16$.

To find the point of intersection of the perpendicular and the second line, solve the two equations.

$$\frac{1}{2}x+16=-2x+1$$
$$\frac{5}{2}x=-15$$
$$x=-6$$

Use the value of x to find the value of y.

$$y=-2x+1$$
$$=13$$

So, the point of intersection is (–6, 13).

Use the Distance Formula to find the distance between the points (–6, 13) and (0, 16).

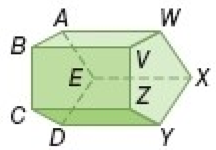
$$d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$$
$$=\sqrt{(0+6)^2+(16-13)^2}$$
$$=\sqrt{36+9}$$
$$=\sqrt{45}$$
$$\approx 6.7$$

Therefore, the distance between the two lines is $\sqrt{45}$ units.

ANSWER:

$\sqrt{45}\approx 6.7$

18. **MULTIPLE CHOICE** Which segment is skew to $\overline{CD}$?



A $\overline{ZY}$
B $\overline{AB}$
C $\overline{DE}$
D $\overline{VZ}$

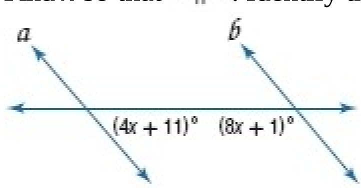
SOLUTION:

Skew lines are lines that do not intersect and are not coplanar. Line segment VZ does not intersect line segment CD and it does not lie in the same plane as CD. The correct answer choice is D.

ANSWER:

D

19. Find *x* so that $a \parallel b$. Identify the postulate or theorem you used.



SOLUTION:

$$\begin{aligned} 4x+11+8x+1&=180 \\ 12x+12&=180 \\ 12x-12&=180-12 \\ 12x&=168 \\ x&=14 \end{aligned}$$

Since $4x+11+8x+1=180$,
a || *b* by the Converse of Consecutive Interior Angles Theorem.

ANSWER:

14; converse of Cons. Int. $\angle$s Thm.

COORDINATE GEOMETRY Find the distance from *P* to ℓ.

20. Line ℓ contains points (–4, 2) and (3, –5). Point *P* has coordinates (1, 2).

SOLUTION:

Find the equation of the line ℓ. Substitute the values in the slope formula.

$$\begin{aligned} m&=\frac{y_2-y_1}{x_2-x_1} \\ &=\frac{-5-2}{3-(-4)} \\ &=\frac{-7}{7} \\ &=-1 \end{aligned}$$

Then write the equation of this line using the point $(3, -5)$.

$$\begin{aligned} y &= mx + b \\ -5 &= -1(3) + b \\ -5 &= -3 + b \\ b &= -2 \end{aligned}$$

Therefore, the equation of the line ℓ is $y = -x - 2$.

Write an equation of the line *w* perpendicular to ℓ through (1, 2). Since the slope of line ℓ is –1, the slope of a line *w* is 1. Write the equation of line *w* through (1, 2) with slope 1.

$$\begin{aligned} y &= mx + b \\ 2 &= 1(1) + b \\ 2 &= 1 + b \\ b &= 1 \end{aligned}$$

Therefore, the equation of the line *w* is $y = x + 1$.

Solve the system of equations to determine the point of intersection.

$$\begin{aligned} -x - 2 &= x + 1 \\ 2x &= -3 \\ x &= -\frac{3}{2} \end{aligned}$$

Use the value of *x* to find the value of y.

$$\begin{aligned} y &= x + 1 \\ &= -\frac{3}{2} + 1 \\ &= -\frac{1}{2} \end{aligned}$$

So, the point of intersection is $\left(-\frac{3}{2}, -\frac{1}{2}\right)$

Use the Distance Formula to find the distance between the points (1, 2) and $\left(-\frac{3}{2}, -\frac{1}{2}\right)$.

$$\begin{aligned} d &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\ &= \sqrt{\left(-\frac{3}{2} - 1\right)^2 + \left(-\frac{1}{2} - 2\right)^2} \\ &= \sqrt{\frac{25}{4} + \frac{25}{4}} \\ &= \sqrt{\frac{50}{2}} \\ &= \frac{5\sqrt{2}}{2} \end{aligned}$$

Therefore, the distance between the two lines is $\frac{5\sqrt{2}}{2}$ or about 3.5units.

ANSWER:

$\frac{5\sqrt{2}}{2} \approx 3.5$

21. Line ℓ contains points (6, 5) and (2, 3). Point *P* has coordinates (2, 6).

SOLUTION:

Find the equation of the line ℓ. Substitute the values in the slope formula.

$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{3-5}{2-6} \\ &= \frac{-2}{-4} \\ &= \frac{1}{2} \end{aligned}$$

Then write the equation of this line using the point (2, 3).

$$\begin{aligned} &y = mx + b \\ &3 = \frac{1}{2}(2) + b \\ &3 = 1 + b \\ &b = 2 \end{aligned}$$

Therefore, the equation of the line ℓ is $y = \frac{1}{2}x + 2.$

Write an equation of the line *w* perpendicular to ℓ and passing through (2, 6). Since the slope of line ℓ is $\frac{1}{2}$, the slope of a line *w* is –2. Write the equation of line *w* through (2, 6) with slope –2.

$$\begin{aligned} &y = mx + b \\ &6 = -2(2) + b \\ &6 = -4 + b \\ &b = 10 \end{aligned}$$

Therefore, the equation of the line *w* is $y = -2x + 10.$

Solve the system of equations to determine the point of intersection.
The left sides of the equations are the same. So, equate the right sides and solve for *x*.

$$\begin{aligned} \frac{1}{2}x + 2 &= -2x + 10 \\ \frac{5}{2}x &= 8 \\ x &= \frac{16}{5} \end{aligned}$$

Use the value of x to find the value of y.

$$
\begin{aligned}
y &= \frac{1}{2}x + 2 \\
&= \frac{1}{2} \times \frac{16}{5} + 2 \\
&= \frac{16 + 20}{10} \\
&= \frac{36}{10} \\
&= \frac{18}{5}
\end{aligned}
$$

So, the point of intersection is $\left(\frac{16}{5}, \frac{18}{5}\right)$

Use the Distance Formula to find the distance between the points (2, 6) and $\left(\frac{16}{5}, \frac{18}{5}\right)$.

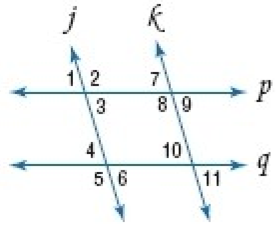
$$
\begin{aligned}
d &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\
&= \sqrt{\left(\frac{16}{5} - 2\right)^2 + \left(\frac{18}{5} - 6\right)^2} \\
&= \sqrt{\frac{36}{25} + \frac{144}{25}} \\
&= \frac{\sqrt{180}}{\sqrt{25}} \\
&= \frac{6\sqrt{5}}{5}
\end{aligned}
$$

Therefore, the distance between the two lines is $\frac{6\sqrt{5}}{5}$ or about 2.7 .

ANSWER:

$\frac{6\sqrt{5}}{5}$ or about 2.7

Given the following information, determine which lines, if any, are parallel. State the postulate or theorem that justifies your answer.



22. $\angle 4 \cong \angle 10$

SOLUTION:

$\angle 4$ and $\angle 10$ are corresponding angles of lines j and k.
Since $\angle 4 \cong \angle 10$, $j \parallel k$ by the Converse of Corresponding Angles Postulate.

ANSWER:

$j \parallel k$; Corresponding Angles Converse Post.

23. $\angle 9 \cong \angle 6$

SOLUTION:

No lines can be proven $\parallel$.

ANSWER:

No lines can be proven $\parallel$.

24. $\angle 7 \cong \angle 11$

SOLUTION:

$\angle 7$ and $\angle 11$ are alternate exterior angles of lines p and q. Since $\angle 7 \cong \angle 11$, $p \parallel q$ by the Converse of the Alternate Exterior Angles Postulate.

ANSWER:

$p \parallel q$; Alternate Exterior Angles Converse Thm.

25. **JOBS** Hailey works at a gift shop after school. She is paid $10 per hour plus a 15% commission on merchandise she sells. Write an equation that represents her earnings in a week if she sold $550 worth of merchandise.

SOLUTION:

Find the commission.

$$\begin{aligned}\text{Commission} &= 550 \times \frac{15}{100} \\ &= \overset{5.5}{\cancel{550}} \times \frac{15}{\cancel{100}} \\ &= 82.5\end{aligned}$$

She has $10 per hour and a commission of $82.5. So, if y is the total earnings and x is the number of hours she worked then the equation is $y = 10x + 82.5$.

ANSWER:

$y = 10x + 82.5$, where x = number of hours worked