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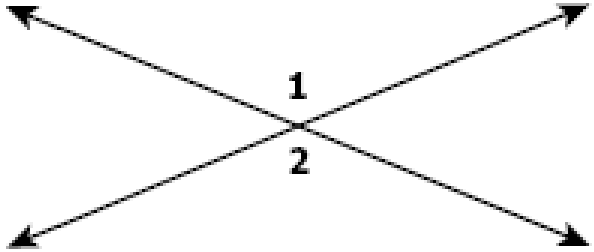
Nov 2011

CHAPTER ONE SOL PROBLEMS

SSM: Super Second-grader Methods

SOL Problems; not Dynamic Variable Problems

10 In this figure, $m\angle 1 = (15x - 5)°$ and $m\angle 2 = (10x + 35)°$.



What is $m\angle 1$?

F 31°
G 65°
H 85°
J 115°

SSM:
- **∠1 is obtuse; only answer J works**

Vertical angles are equal

$15x - 5 = 10x + 35$

$5x - 5 = 35$

$5x = 40$

$x = 8$

Substitute: $m\angle 1 = 15(8) - 5 = 115$

41 If the coordinates of A are (1, 1) and the midpoint of $\overline{AB}$ is (−2, 0), then the coordinates of B are —

A (−0.5, 0.5)
B (0.5, 0.5)
C (−1, 0)
D (−5, −1)

SSM:
- **plot points and see which make sense**

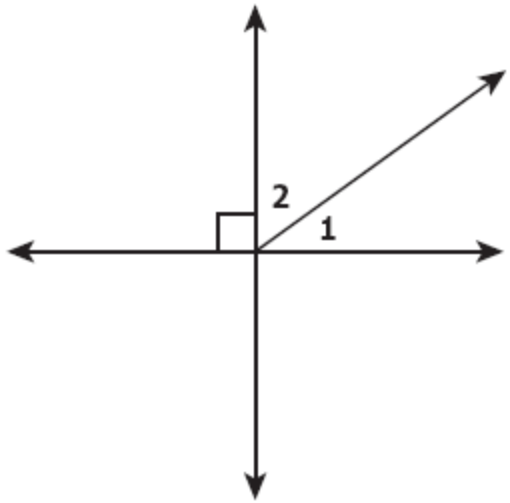
Midpoint formula:

[(x1 + x2)/2 , (y1 + y2)/2] = [(1 + x)/2 , (1 + y)/2] = [-2, 0]

(1 + x)/2 = -2 → 1 + x = -4
x = -5

(1 + y)/2 = 0 → 1 + y = 0
y = -1

1 In the figure shown, $m\angle 1 = (4x + 12)°$ and $m\angle 2 = (6x + 8)°$.



What is $m\angle 1$?

A 20°
B 40°
C 50°
D 76°

SSM:

- Corner of scratch paper tells us that $\angle 1 + \angle 2 = 90°$
- Our eyes tell us that $\angle 2 > \angle 1$, but not by much
- Answers A & B are possible, with B fitting better

Angle 1 and Angle 2 are complimentary

$\angle 1 + \angle 2 = 90°$

$(4x + 12) + (6x + 8) = 90$

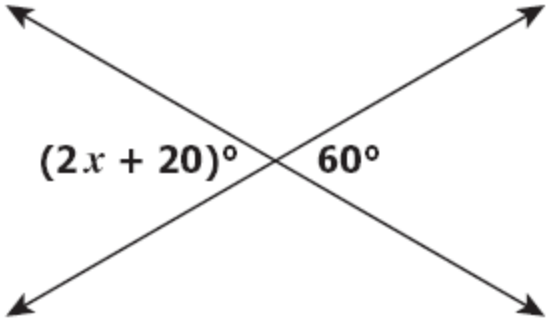
$10x + 20 = 90$

$10x = 70$

$x = 7$

$m\angle 1 = 4(7) + 12 = 40°$

6 Two lines intersect as shown.



What is the value of x ?

F 20
G 40
H 50
J 60

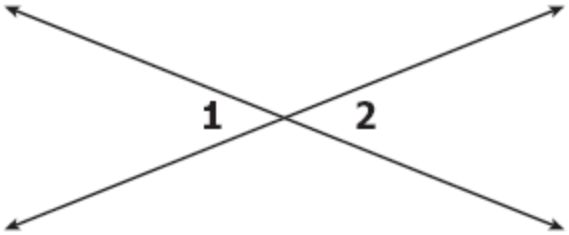
SSM:

- **Two acute angles: assume equal**
- **Plug answers in for x**

Vertical Angles are equal

$$2x + 20 = 60$$
$$2x = 40$$
$$x = 20$$

8 In the diagram, $m\angle 1 = (6x + 12)°$ and $m\angle 2 = (9x - 4)°$.



Which is closest to the value of x ?

F 5.3
G 5.5
H 11.5
J 12.5

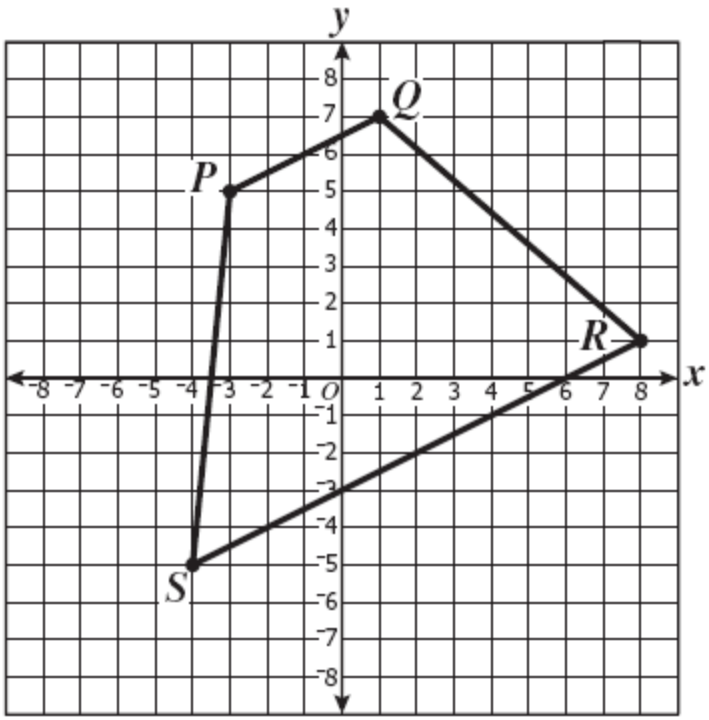
SSM:

- **Our eyes tell us that $\angle 1$ and $\angle 2$ are small acute angles**
- **Plug in answers: only F and G give small acute angles**

Vertical angles are equal

6x + 12 = 9x – 4
6x + 16 = 9x
16 = 3x
16/3 = x

39 $P(^{-}3, 5)$, $Q(1, 7)$, $R(8, 1)$, and $S(^{-}4, ^{-}5)$ are connected to form a trapezoid.



What is the midpoint of $\overline{SR}$?

A (0, ⁻3)
B (4, ⁻1)
C (3, ⁻1.5)
D (2, ⁻2)

Midpoint formula:

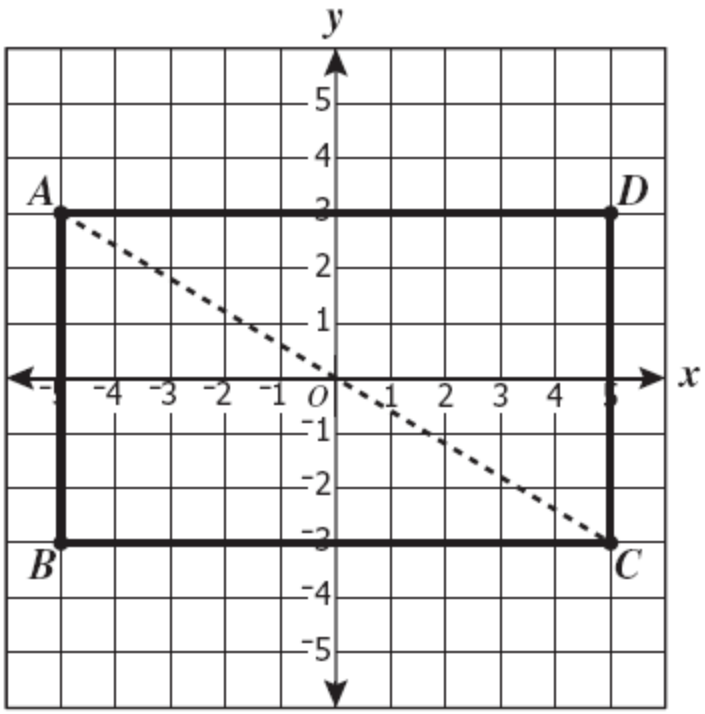
$$\left(\frac{-4+8}{2}, \frac{-5+1}{2}\right)$$

(2, -2)

SSM:

- **plot the answers (points)**
- **which is in the middle and on SR**

41 Rectangle $ABCD$ is placed on a grid as shown.



Which is *closest* to the length of diagonal $\overline{AC}$?

A 8.0
B 10.0
C 11.3
D 11.7

SSM:
- measure AC
- use graph to estimate

Pythagorean Theorem

$6^2 + 10^2 = AC^2$

$36 + 100 = AC^2$

$136 = AC^2$

$11.67 = AC$

or

Distance formula

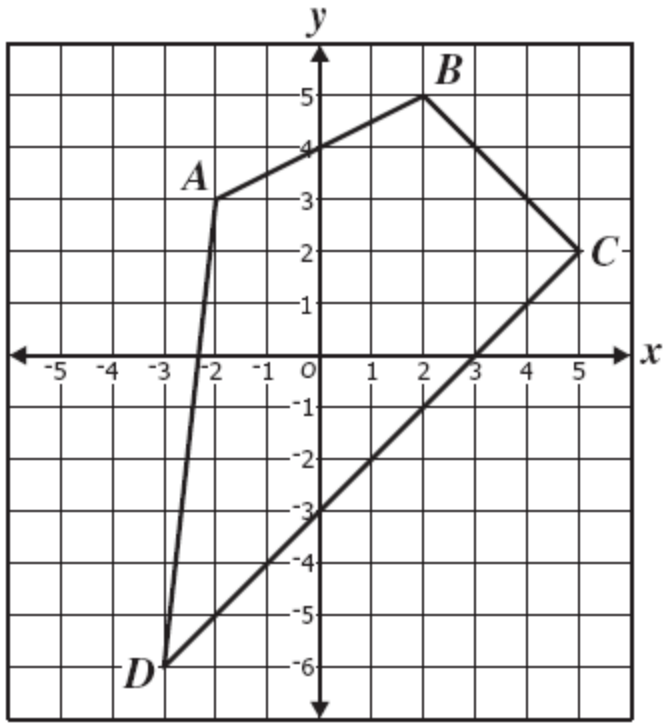
$\sqrt{(-5 - 5)^2 + (3 - (-3))^2}$

$\sqrt{(-10)^2 + (6)^2}$

$\sqrt{(100 + 36)}$

$\sqrt{136} = 11.67$

44 A quadrilateral is placed on a grid as shown.



The apparent midpoint of $\overline{BD}$ is —

F $(^{-}0.5, ^{-}0.5)$
G (0.5, 3.5)
H (1.5, 1.5)
J (1.5, 2.5)

Midpoint formula:

$$\left(\frac{-3+2}{2}, \frac{-6+5}{2}\right)$$

(-0.5, -0.5)

SSM:

- plot the answers (points)
- draw BD
- which is in the middle and on BD

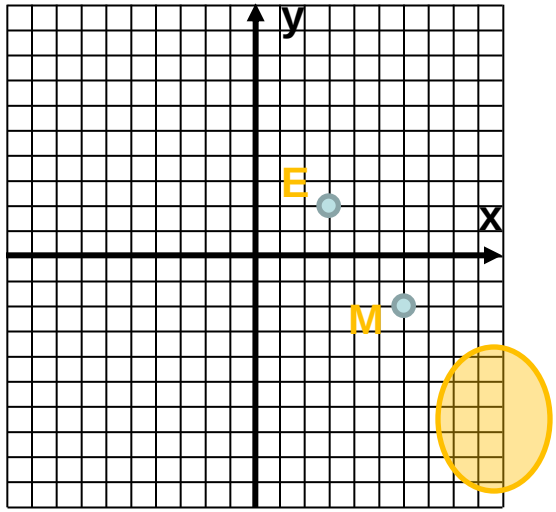
44 A line segment has an endpoint at (3, 2). If the midpoint of the line segment is (6, ⁻2), what are the coordinates of the point at the other end of the line segment?

F (4.5, 0)
G (0, 6)
H (9, 4)
J (9, ⁻6)

Midpoint formula:

$$\left(\frac{(3+x)}{2}, \frac{(2+y)}{2} \right) = (6, -2)$$

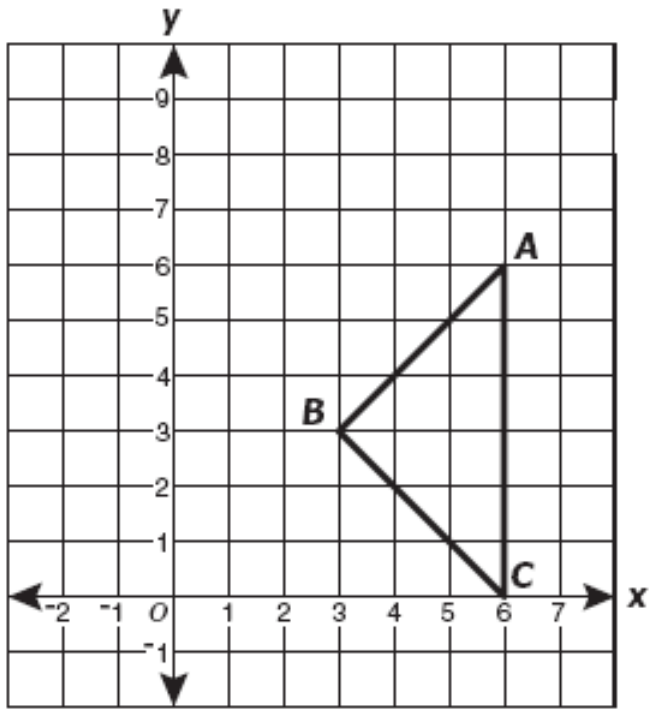
$$(3 + x, 2 + y) = (12, -4)$$
$$(x, y) = (9, -6)$$



answer area

SSM:
- plot given midpoint and endpoint of graph
- plot answer points on graph

43 Triangle *ABC* is placed on a grid as shown.



The apparent midpoint of $\overline{AB}$ is —

A $(1.5, 1.5)$

B $(3, 3)$

C $(4.5, 4.5)$

D $(4.5, 1.5)$

SSM:
- **plot each answer on graph paper**
- **only answer C between AB**

midpoint formula: $((x_1+x_2)/2 , (y_1+y_2)/2)$

$((3+6)/2 , (3+6)/2) = (9/2, 9/2) = (4.5, 4.5)$

4 **What are the measures of two complementary angles if the difference of their measures is 18°?**

F 36°, 54°

G 41°, 49°

H 81°, 99°

J 86°, 94°

SSM:

- **complement → adds to 90**
- **eliminates H and J**

x + y = 90 **complementary**

x – y = 18 **difference of 18**

2x = 108 **(add line 1 and 2)**

x = 54

45 **What is the midpoint of the segment joining (12, 2) and (−5, −7)?**

A (9, 17)

B (5, −3)

C (8.5, 4.5)

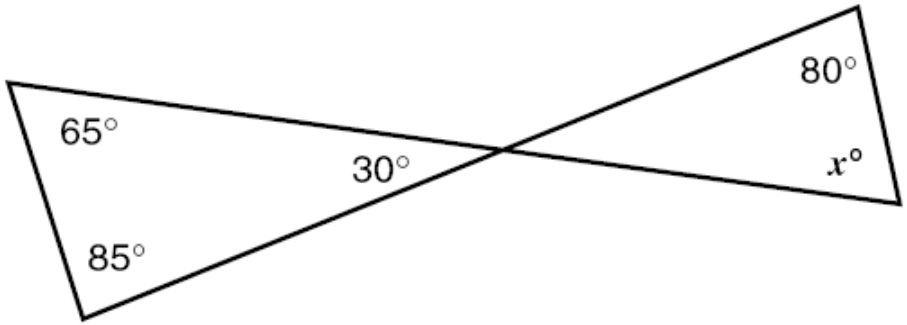
D (3.5, −2.5)

SSM:

- **draw endpoints on graph paper**
- **plots answer points**

- **Midpoint ((12-5)/2, (2-7)/2) = (7/2, -5/2) = (3.5, -2.5)**

1 The measures of some angles are given in the figure.



What is the value of x?

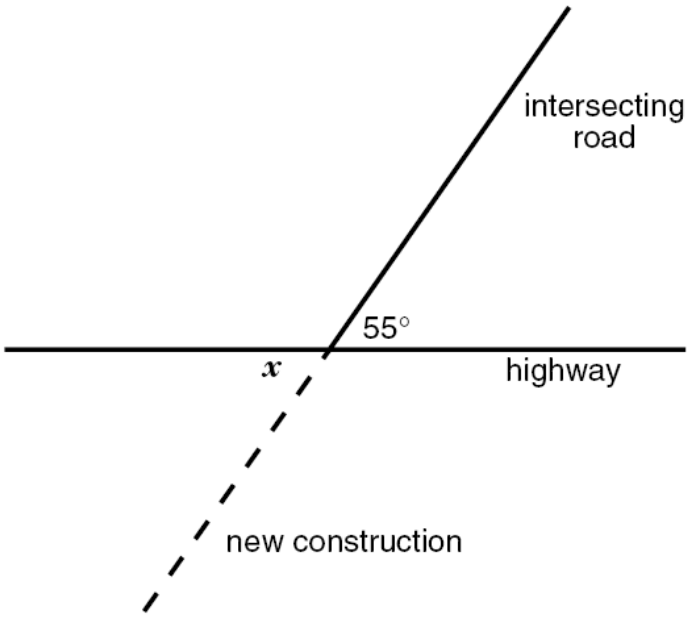
A 65
B 70
C 80
D 85

SSM:
- **Angle 2 is large acute**
- **Angle x is smaller than 80 but bigger than 65**

Angle x is an acute angle
Three angles sum to 180
missing angle* is 30 *(vertical angle)

80 + 30 = 110 **180 – 110 = 70**

3 **The Department of Transportation wants to extend the intersecting road across the highway, as indicated by the dotted line.**



What should x be to ensure that the intersecting road and the new construction form a straight line?

A 35°
B 55°
C 105°
D 125°

SSM:

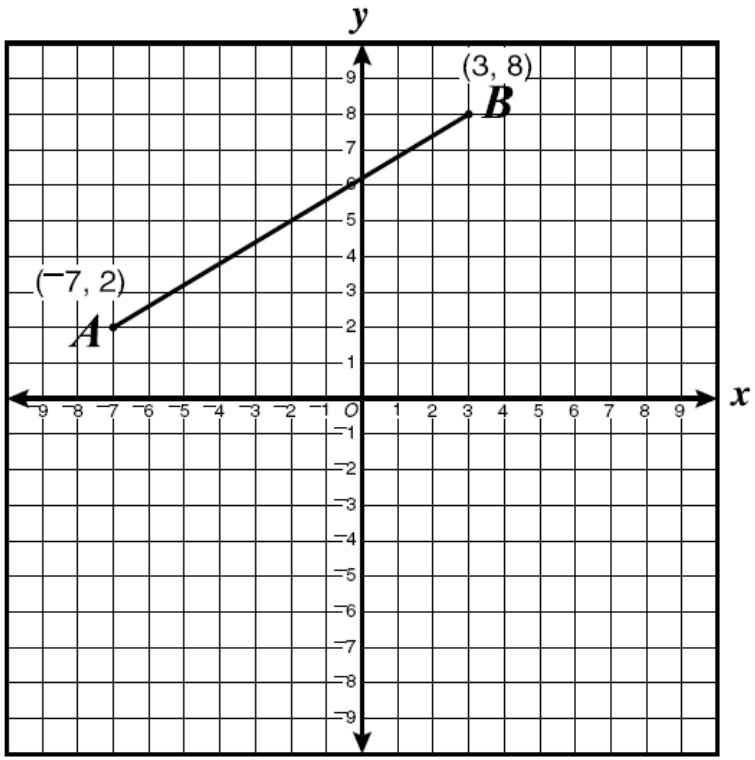
- **Angle x is an acute angle**
- **"vertical" angles!**

Angle x is an acute angle

To form an "x" – two straight lines need to have a vertical angle

x = 55

40



The coordinates of the midpoint of $\overline{AB}$ are —

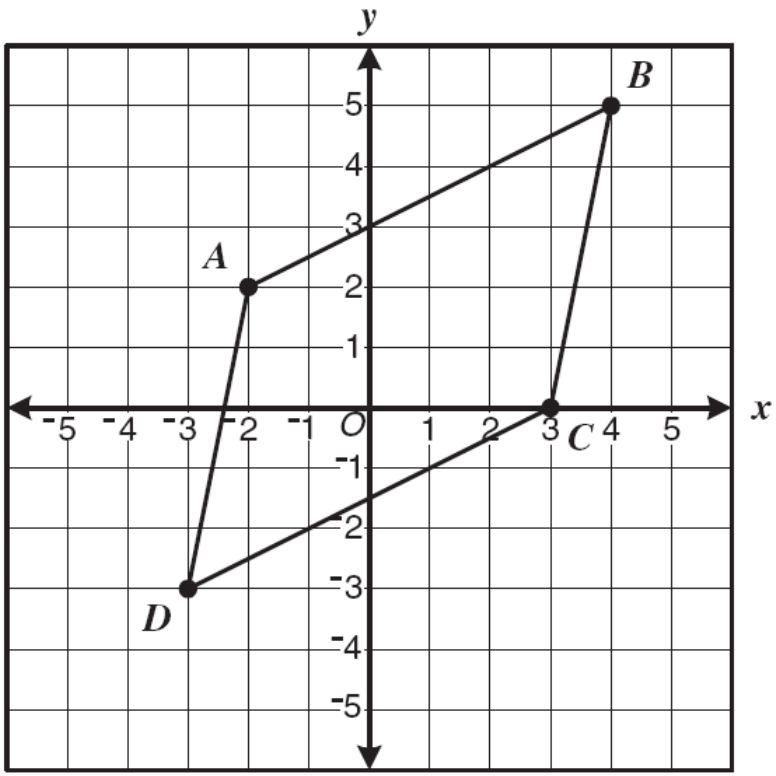
F (5, 3)
G (−5, 3)
H (2, 5)
J (−2, 5)

SSM:
- **plot each answer on graph paper**
- **only answer C between AB**

midpoint formula: ($(x_1+x_2)/2$, $(y_1+y_2)/2$)

((3+6)/2 , (3+6)/2) = (9/2, 9/2) = (4.5, 4.5)

41 **Parallelogram *ABCD* is placed on a coordinate grid as shown.**



What is the approximate length of diagonal $\overline{AC}$?

A 3.0 units

B 5.4 units

C 9.0 units

D 10.6 units

SSM:

- **measure AC on scratch paper**
- **lay out on graph and estimate the distance**

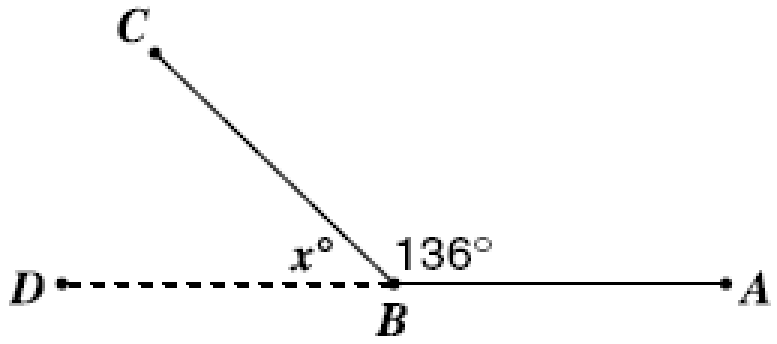
distance formula:

$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$\sqrt{(-2 - 3)^2 + (2 - 0)^2}$

$\sqrt{(-5)^2 + 2^2} = \sqrt{29}$

1 A plumber bent a flexible joint into a 136° angle, as shown. He then attached another pipe so that A, B, and D lay on a straight line.



What is the value of x?

A 36
B 44
C 46
D 224

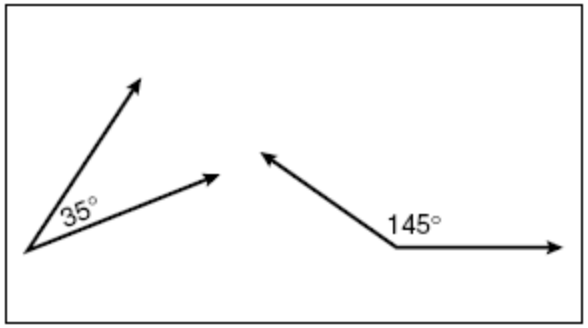
SSM:
- x is an acute angle
- 180 is a magic number
- 180 – 136 = 44

Straight line means linear pair (supplementary angles)

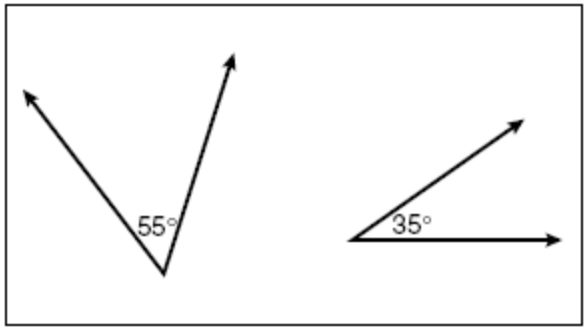
180 – 136 = 44

3 Which pair of angles is supplementary?

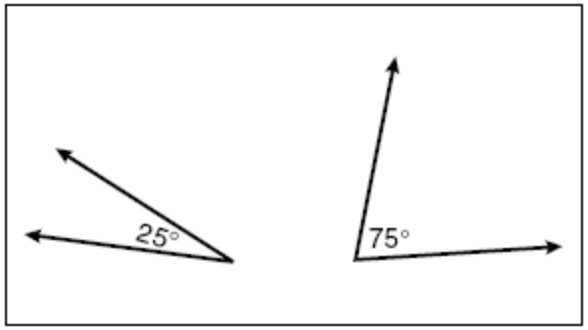
A



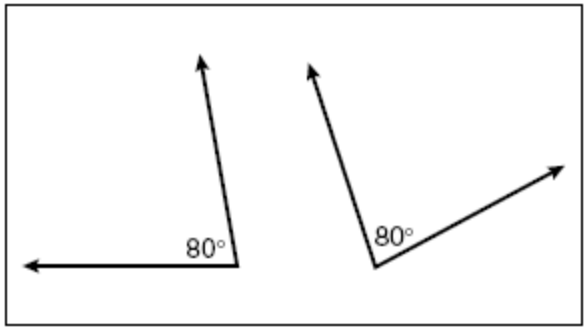
B



C



D

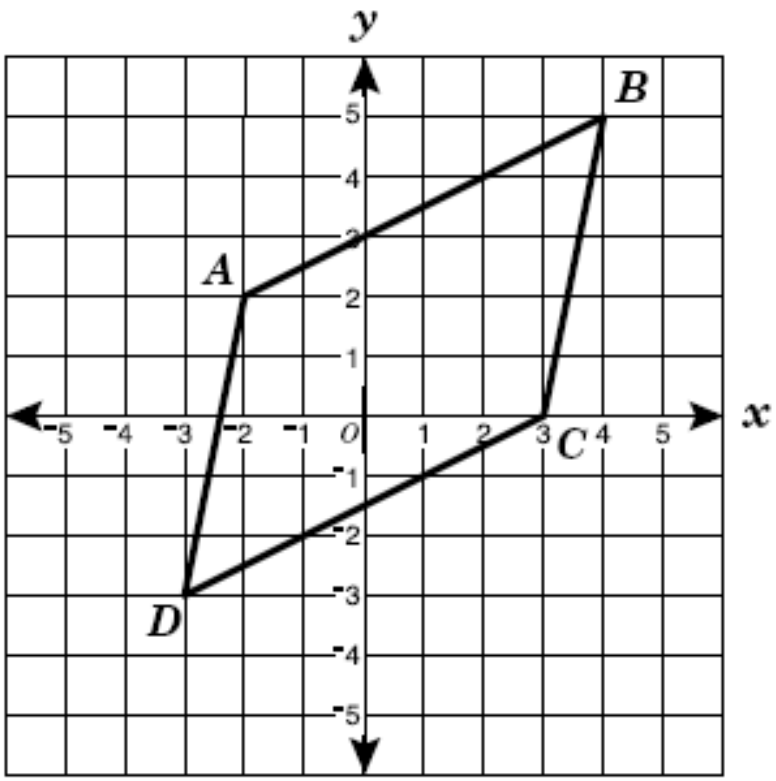


Supplementary means adds to 180

SSM:

- **add all pairs**
- **which is "magic" number, 180**

44



What are the apparent coordinates of the midpoint of diagonal $\overline{AC}$?

F $\left(\frac{1}{2}, -1\right)$

G $\left(\frac{1}{2}, 1\right)$

H $\left(1, \frac{1}{2}\right)$

J $(1, 1)$

SSM:

- **plot each answer on graph paper**
- **only answer C between AC**

midpoint formula:

($(x_1+x_2)/2$, $(y_1+y_2)/2$)

((-2+3)/2 , (2+0)/2) = (1/2, 2/2) = (1/2, 1)

45 The distance between the points $(-2, -4)$ and $(3, 8)$ is —

A $\sqrt{17}$
B 13
C 17
D 169

SSM:
- plot points on graph paper
- measure distance with scratch paper
- use graph paper to estimate distance
- Answers A & D wrong

Pythagorean Theorem

$5^2 + 12^2 = AC^2$

$25 + 144 = AC^2$

$169 = AC^2$

$13 = AC$

or

Distance formula

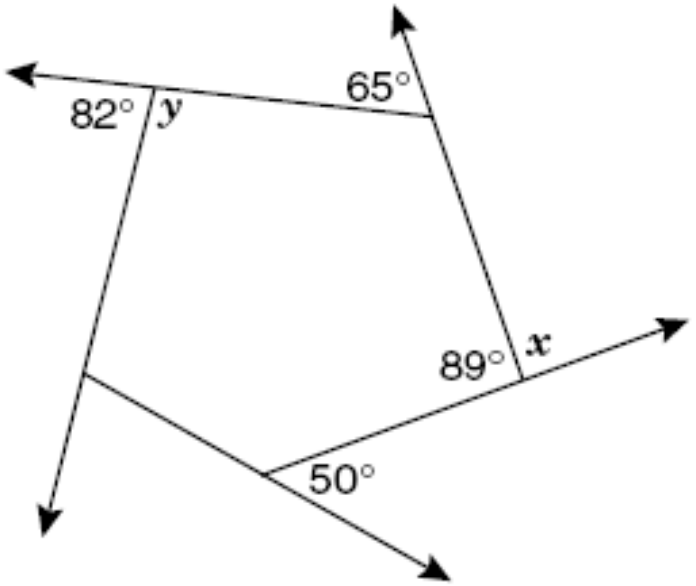
$\sqrt{(-2 - 3)^2 + (-4 - 8)^2}$

$\sqrt{(-5)^2 + (-12)^2}$

$\sqrt{(25 + 144)}$

$\sqrt{169} = 13$

1



What are the values of x, and y?

A $x = 91°, y = 98°$
B $x = 91°, y = 108°$
C $x = 101°, y = 98°$
D $x = 101°, y = 108°$

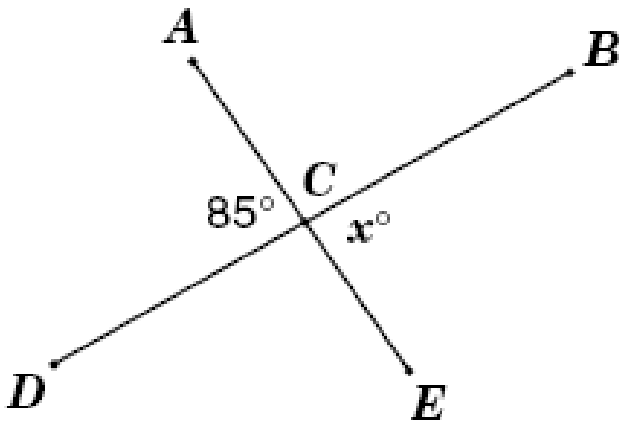
SSM:
- **both are obtuse angles**
- **subtract from 180**

x and y form linear pairs with adjacent angles

180 – 82 = 98 = y

180 – 89 = 91 = x

2 Given: B, C, and D are collinear;
$m\angle ACD = 85°$



What value of x will ensure that A, C, and E are also collinear?

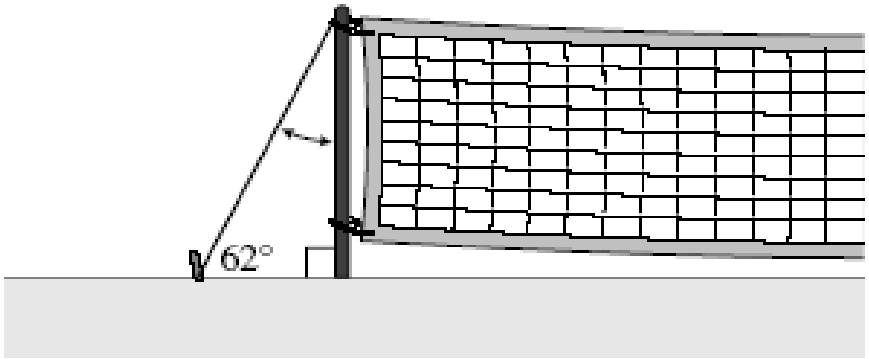
F 75
G 85
H 95
J 105

SSM:
- **corner of scratch paper x is large acute angle – not quite 90**

To ensure A, C and E are collinear x must be a vertical angle

x = 85

3 A guy wire for a pole for a tennis net makes an angle of 62° with the ground.



What is the measure of the angle between the wire and the pole?

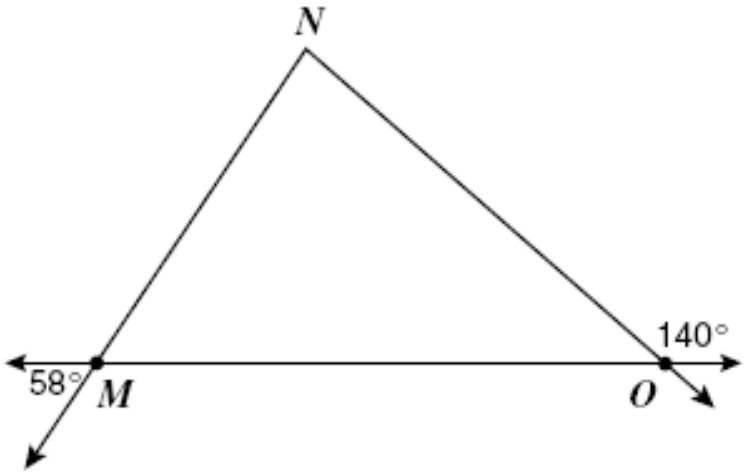
A 28°
B 62°
C 90°
D 180°

SSM:
- **angle is small acute**
- **only answer A fits**

3 angles of triangle add to 180

180 – 90 – 62 = 28

5 The measures of some angles are given in this figure.



What is the measure of $\angle N$?

A 40°
B 58°
C 82°
D 122°

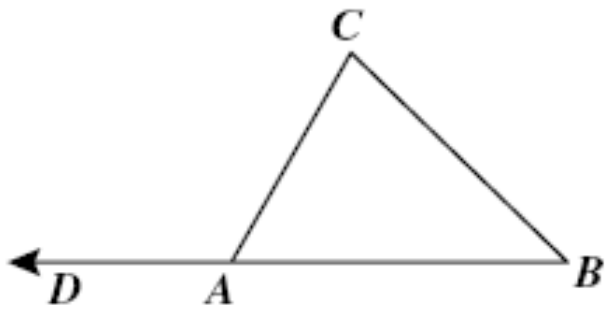
SSM:
- **use corner of scrap paper**
- **angle N is very large acute**

angle MON = 40 (linear pair with 140)

angle NMO = 58 (vertical with 58)

angle N = 180 – 40 – 58 = 82

28 In the figure, the measure of $\angle CAD$ is twice the measure of $\angle CAB$.



What is the measure of $\angle CAB$?

F 120°
G 60°
H 45°
J 30°

SSM:
- **angle CAB is acute so answer F is wrong**
- **angle CAD is obtuse double answers to see which is obtuse**

Linear pair: sums to 180

$$x + 2x = 180$$
$$3x = 180$$
$$x = 60$$

43 Which point is the greatest distance from the origin?

A $(-8, -5)$

B $(-9, 1)$

C $(3, 4)$

D $(9, 2)$

SSM:
- plot points on graph paper
- measure distance with scrap paper

Greatest distance from origin will result in the greatest sum of numbers squared!

A) $8^2 + 5^2 = 64 + 25 = 89$

B) $9^2 + 1^2 = 81 + 1 = 82$

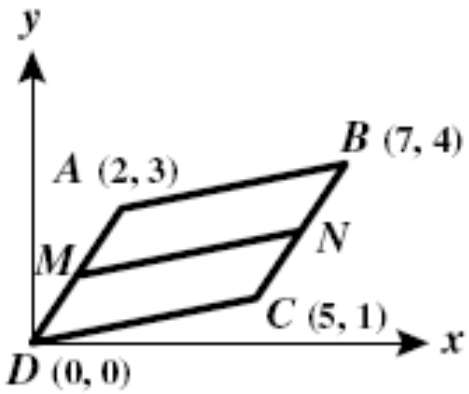
C) $3^2 + 4^2 = 9 + 16 = 25$

D) $9^2 + 2^2 = 81 + 4 = 85$

89 is the largest so A is correct answer

Pythagorean Theorem or Distance formula can also be used for each point

44



Parallelogram $ABCD$ is positioned on a coordinate plane with the coordinates as shown. N is the midpoint of $\overline{BC}$. What are the coordinates of N?

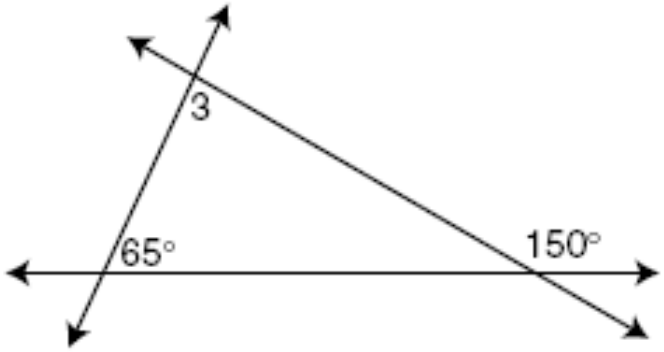
F (2, 3)
G (3.5, 2)
H (2.5, 6)
J (6, 2.5)

SSM:
- **plot each answer on graph paper**
- **only answer C between BC**

midpoint formula: $\left(\frac{x_1+x_2}{2} , \frac{y_1+y_2}{2} \right)$

$\left(\frac{5+7}{2} , \frac{1+4}{2} \right) = \left(\frac{12}{2}, \frac{5}{2} \right) = (6, 2.5)$

1



What is m∠3?

A 65°
B 75°
C 85°
D 90°

SSM:
- **angle 3 is large acute eliminates A and D**

150 is an exterior angle

by Ext Angle Theorem 150 = 65 + ∠3
85 = ∠3

3 **Angle 1 is a complement of angle 2. If $m\angle 1 = (14x + 8)$ and $m\angle 2 = (8x - 6)$, what is the value of x and of $m\angle 1$?**

A $x = 4, m\angle 1 = 26°$

B $x = 4, m\angle 1 = 64°$

C $x = 113.3, m\angle 1 = 121.3°$

D $x = 113.3, m\angle 1 = 58.7°$

SSM:

- **plug in answers and check angle measurements**
- **only answer B works**

Complements → adds to 90

90 = (14x + 8) + (8x – 6)
= 22x + 2
88 = 22x

4 = x **m∠1 = 14(4) + 8 = 56 + 8 = 64**

43 The coordinates of the midpoint of $\overline{AB}$ are $(-2, 1)$, and the coordinates of A are $(2, 3)$. What are the coordinates of B?

A $(0, 2)$
B $(-1, 2)$
C $(-3, 4)$
D $(-6, -1)$

SSM:

- **plot the points given on graph paper**
- **remember B is an end point!**

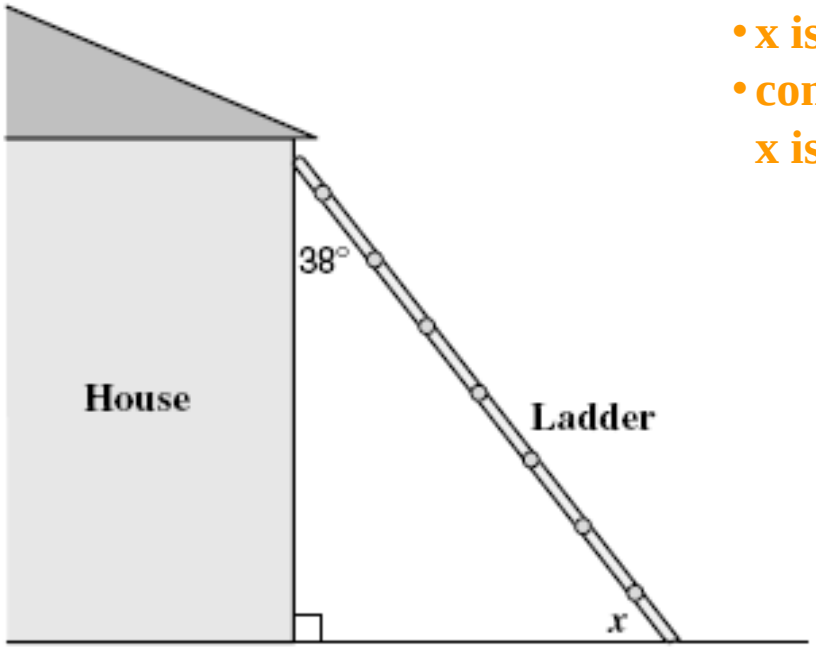
Midpoint formula:

$$\frac{(x+2)}{2}, \frac{(y+3)}{2} = (-2, 1) \quad \rightarrow \quad \tfrac{1}{2}(x+2) = -2 \text{ and } \tfrac{1}{2}(y+3) = 1$$

$$x + 2 = -4 \qquad y + 3 = 2$$

$$x = -6 \qquad y = -1$$

2 A ladder is leaning against a house at an angle of 38° as shown in the diagram.



SSM:

- **x is an acute angle**
- **compare with folded corner of scrap paper**
  x is bigger than 45

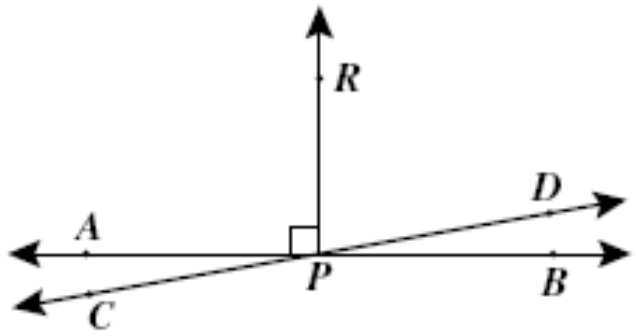
What is the measure of the angle, x, between the ladder and the ground?

F 38°
G 42°
H 52°
J 142°

3 angles in a triangle add to 180

x = 180 – 90 – 38 = 52

3 Lines AB and CD intersect at P. $\overrightarrow{PR}$ is perpendicular to $\overleftrightarrow{AB}$, and m $\angle APD = 170°$.



What is the measure $\angle DPB$?

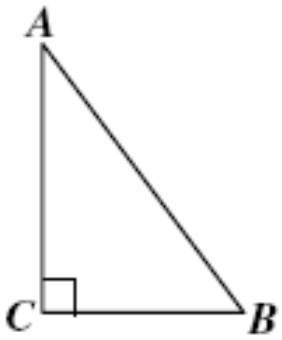
A 10°
B 20°
C 30°
D 40°

SSM:
- **small acute angle**
- **C and D don't fit**

$\angle$APD and $\angle$DPB form linear pair (adjacent angles)

180 – 170 = 10 = $\angle$DPB

8



SSM:
- **both angles are acute eliminates J**

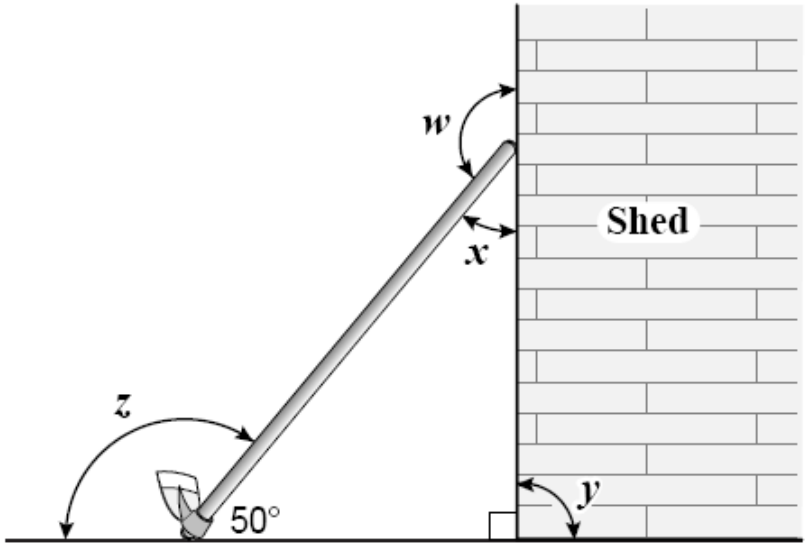
Triangle ABC is a right triangle with the right angle at C. Which are possible measures for angle A and angle B?

F 48° and 50°
G 38° and 32°
H 52° and 38°
J 52° and 128°

Angle A and B must be complementary (since all 3 angles add to 180)

Only answer H does both angles add together to 90

2 A gardener rested his hoe against a shed. The hoe made a 50° angle with the ground as shown in the diagram below.



SSM:

- the angle z forms a linear pair with the 50° and is supplementary

Which represents the supplement to the 50° angle?

F w

G x

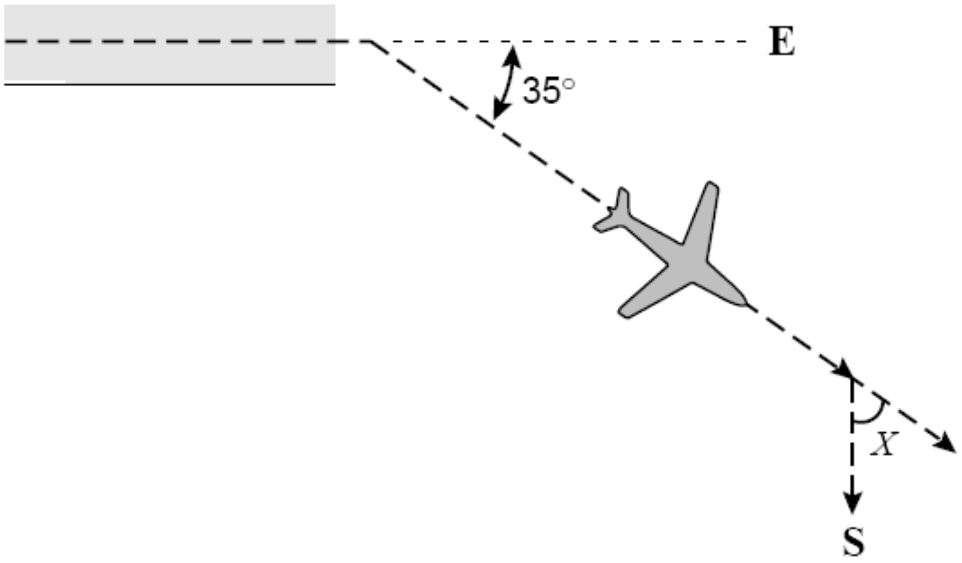
H y

J z

Looking for a obtuse angle (130°)

Rules out all but z or w (and w = 140°)

3



SSM:

- **angle x is acute and 35 + x = 90**

An airplane leaves a runway heading due east then turns 35° to the right as shown in the figure. How much more will the airplane have to turn to be heading due south?

A 10°
B 45°
C 55°
D 65°

From East to South is a 90° angle

so 90 – 35 = 65