

1.3 EXERCISES

HOMEWORK KEY

○ = WORKED-OUT SOLUTIONS on p. WS1 for Exs. 15, 35, and 49

★ = STANDARDIZED TEST PRACTICE Exs. 2, 23, 34, 41, 42, and 53

SKILL PRACTICE

1. **VOCABULARY** Copy and complete: To find the length of \overline{AB} , with endpoints $A(-7, 5)$ and $B(4, -6)$, you can use the ?.

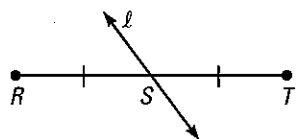
2. ★ **WRITING** Explain what it means to bisect a segment. Why is it impossible to bisect a line?

EXAMPLE 1

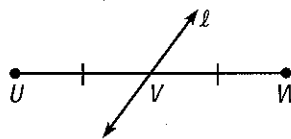
on p. 15
for Exs. 3–10

FINDING LENGTHS Line l bisects the segment. Find the indicated length.

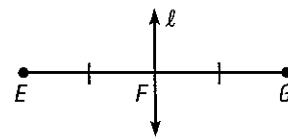
3. Find RT if $RS = 5\frac{1}{8}$ in.



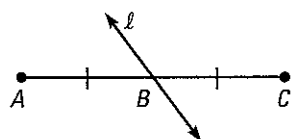
4. Find UW if $VW = \frac{5}{8}$ in.



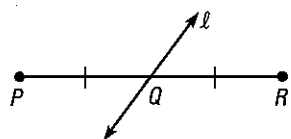
5. Find EG if $EF = 13$ cm.



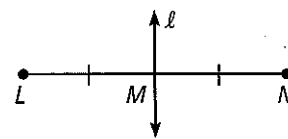
6. Find BC if $AC = 19$ cm.



7. Find QR if $PR = 9\frac{1}{2}$ in.



8. Find LM if $LN = 137$ mm.



9. **SEGMENT BISECTOR** Line RS bisects \overline{PQ} at point R . Find RQ if $PQ = 4\frac{3}{4}$ inches.

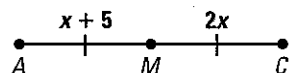
10. **SEGMENT BISECTOR** Point T bisects \overline{UV} . Find UV if $UT = 2\frac{7}{8}$ inches.

EXAMPLE 2

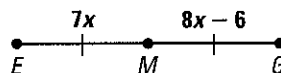
on p. 16
for Exs. 11–16

11. **ALGEBRA** In each diagram, M is the midpoint of the segment. Find the indicated length.

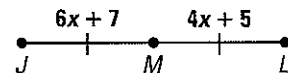
11. Find AM .



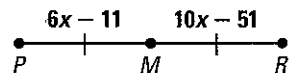
12. Find EM .



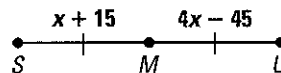
13. Find JM .



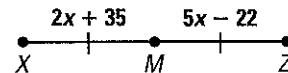
14. Find PR .



15. Find SU .



16. Find XZ .



EXAMPLE 3

on p. 17
for Exs. 17–30

FINDING MIDPOINTS Find the coordinates of the midpoint of the segment with the given endpoints.

17. $C(3, 5)$ and $D(7, 5)$

18. $E(0, 4)$ and $F(4, 3)$

19. $G(-4, 4)$ and $H(6, 4)$

20. $J(-7, -5)$ and $K(-3, 7)$

21. $P(-8, -7)$ and $Q(11, 5)$

22. $S(-3, 3)$ and $T(-8, 6)$

23. ★ **WRITING** Develop a formula for finding the midpoint of a segment with endpoints $A(0, 0)$ and $B(m, n)$. Explain your thinking.

24. **ERROR ANALYSIS** Describe the error made in finding the coordinates of the midpoint of a segment with endpoints $S(8, 3)$ and $T(2, -1)$.

$$\left(\frac{8-2}{2}, \frac{3-(-1)}{2}\right) = (3, 2)$$

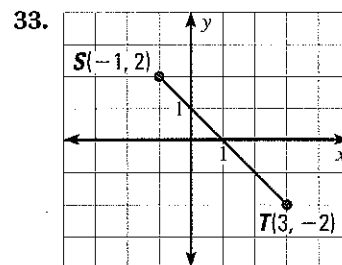
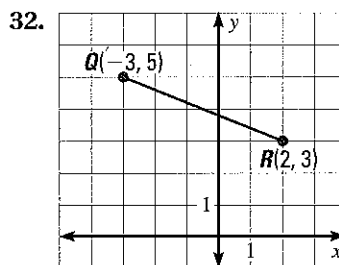
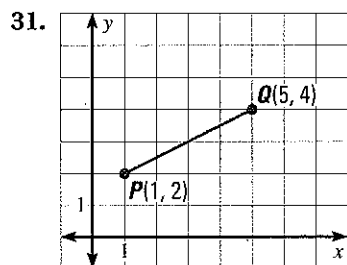


FINDING ENDPOINTS Use the given endpoint R and midpoint M of \overline{RS} to find the coordinates of the other endpoint S .

25. $R(3, 0), M(0, 5)$ 26. $R(5, 1), M(1, 4)$ 27. $R(6, -2), M(5, 3)$
 28. $R(-7, 11), M(2, 1)$ 29. $R(4, -6), M(-7, 8)$ 30. $R(-4, -6), M(3, -4)$

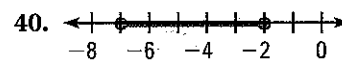
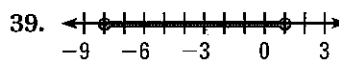
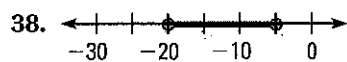
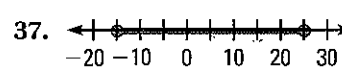
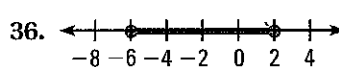
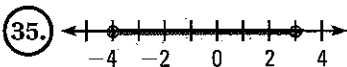
EXAMPLE 4
 on p. 18
 for Exs. 31–34

DISTANCE FORMULA Find the length of the segment. Round to the nearest tenth of a unit.



34. **★ MULTIPLE CHOICE** The endpoints of \overline{MN} are $M(-3, -9)$ and $N(4, 8)$. What is the approximate length of \overline{MN} ?
 (A) 1.4 units (B) 7.2 units (C) 13 units (D) 18.4 units

NUMBER LINE Find the length of the segment. Then find the coordinate of the midpoint of the segment.



41. **★ MULTIPLE CHOICE** The endpoints of \overline{LF} are $L(-2, 2)$ and $F(3, 1)$. The endpoints of \overline{JR} are $J(1, -1)$ and $R(2, -3)$. What is the approximate difference in the lengths of the two segments?
 (A) 2.24 (B) 2.86 (C) 5.10 (D) 7.96

42. **★ SHORT RESPONSE** One endpoint of \overline{PQ} is $P(-2, 4)$. The midpoint of \overline{PQ} is $M(1, 0)$. Explain how to find PQ .

COMPARING LENGTHS The endpoints of two segments are given. Find each segment length. Tell whether the segments are congruent.

43. \overline{AB} : $A(0, 2), B(-3, 8)$ 44. \overline{EF} : $E(1, 4), F(5, 1)$ 45. \overline{JK} : $J(-4, 0), K(4, 8)$
 \overline{CD} : $C(-2, 2), D(0, -4)$ \overline{GH} : $G(-3, 1), H(1, 6)$ \overline{LM} : $L(-4, 2), M(3, -7)$

46. **ALGEBRA** Points $S, T,$ and P lie on a number line. Their coordinates are 0, 1, and x , respectively. Given $SP = PT$, what is the value of x ?

47. **CHALLENGE** M is the midpoint of \overline{JK} , $JM = \frac{x}{8}$, and $JK = \frac{3x}{4} - 6$. Find MK .

○ = WORKED-OUT SOLUTIONS
 on p. WS1


★ = STANDARDIZED
 TEST PRACTICE

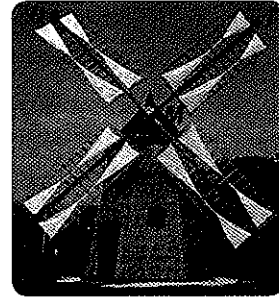
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PROBLEM SOLVING


EXAMPLE 1
on p. 15
for Ex. 48

- 48. WINDMILL** In the photograph of a windmill, \overline{ST} bisects \overline{QR} at point M . The length of \overline{QM} is $18\frac{1}{2}$ feet. Find QR and MR .

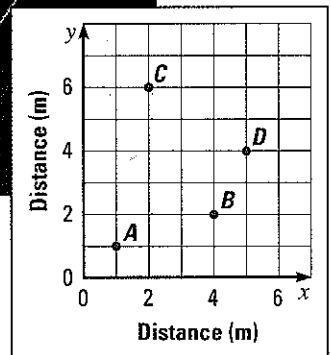
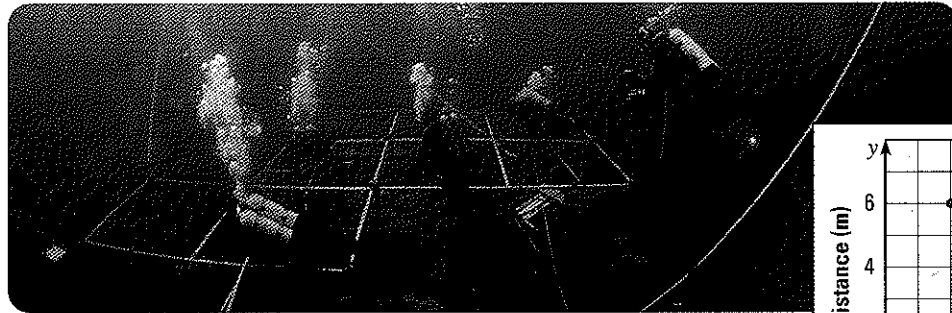
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- 49. DISTANCES** A house and a school are 5.7 kilometers apart on the same straight road. The library is on the same road, halfway between the house and the school. Draw a sketch to represent this situation. Mark the locations of the house, school, and library. How far is the library from the house?

 for problem solving help at classzone.com

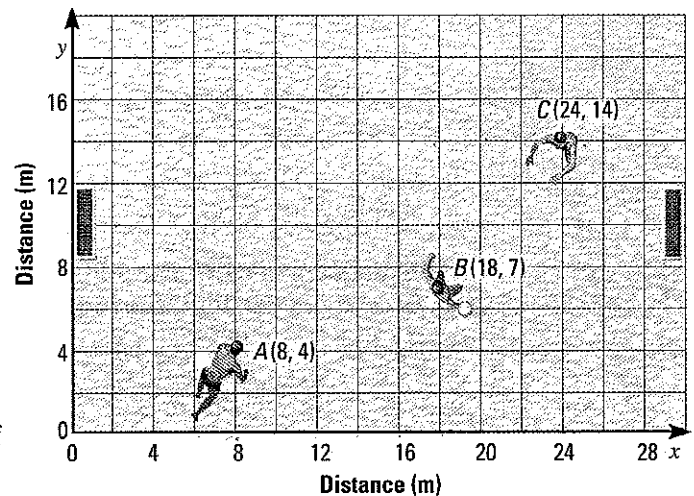
ARCHAEOLOGY The points on the diagram show the positions of objects at an underwater archaeological site. Use the diagram for Exercises 50 and 51.



- 50.** Find the distance between each pair of objects. Round to the nearest tenth of a meter if necessary.
- | | | |
|------------|------------|------------|
| a. A and B | b. B and C | c. C and D |
| d. A and D | e. B and D | f. A and C |
- 51.** Which two objects are closest to each other? Which two are farthest apart?

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- 52. WATER POLO** The diagram shows the positions of three players during part of a water polo match. Player A throws the ball to Player B, who then throws it to Player C. How far did Player A throw the ball? How far did Player B throw the ball? How far would Player A have thrown the ball if he had thrown it directly to Player C? Round all answers to the nearest tenth of a meter.



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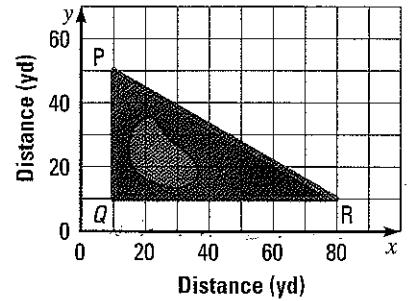
2)

30

7)

53. ★ **EXTENDED RESPONSE** As shown, a path goes around a triangular park.

- Find the distance around the park to the nearest yard.
- A new path and a bridge are constructed from point Q to the midpoint M of \overline{PR} . Find QM to the nearest yard.
- A man jogs from P to Q to M to R to Q and back to P at an average speed of 150 yards per minute. About how many minutes does it take? *Explain.*

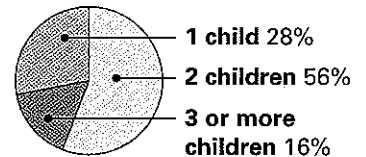


54. **CHALLENGE** \overline{AB} bisects \overline{CD} at point M , \overline{CD} bisects \overline{AB} at point M , and $AB = 4 \cdot CM$. Describe the relationship between AM and CD .

MIXED REVIEW

The graph shows data about the number of children in the families of students in a math class. (p. 888)

- What percent of the students in the class belong to families with two or more children?
- If there are 25 students in the class, how many students belong to families with two children?



PREVIEW

Prepare for Lesson 1.4 in Exs. 57–59.

Solve the equation. (p. 875)

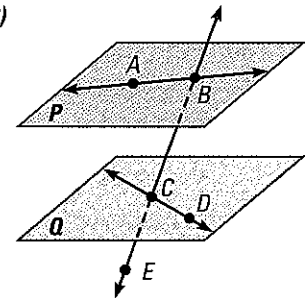
57. $3x + 12 + x = 20$

58. $9x + 2x + 6 - x = 10$

59. $5x - 22 - 7x + 2 = 40$

In Exercises 60–64, use the diagram at the right. (p. 2)

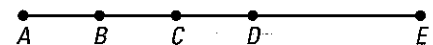
- Name all rays with endpoint B .
- Name all the rays that contain point C .
- Name a pair of opposite rays.
- Name the intersection of \overleftrightarrow{AB} and \overleftrightarrow{BC} .
- Name the intersection of \overleftrightarrow{BC} and plane P .



QUIZ for Lessons 1.1–1.3

- Sketch two lines that intersect the same plane at two different points. The lines intersect each other at a point not in the plane. (p. 2)

In the diagram of collinear points, $AE = 26$, $AD = 15$, and $AB = BC = CD$. Find the indicated length. (p. 9)

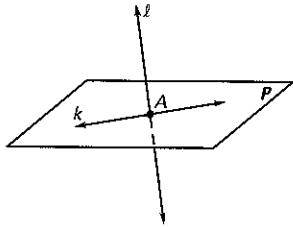


- DE
 - AB
 - AC
 - BD
 - CE
 - BE
- The endpoints of \overline{RS} are $R(-2, -1)$ and $S(2, 3)$. Find the coordinates of the midpoint of \overline{RS} . Then find the distance between R and S . (p. 15)

Selected Answers

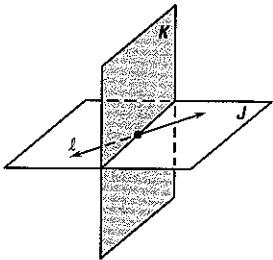
Chapter 1

1.1 Skill Practice (pp. 5-7) 1. a. point Q b. line segment MN c. ray ST d. line FG 3. \overleftrightarrow{QW} , line g 5. *Sample answer:* points R, Q, S; point T 7. Yes; through any three points not on the same line, there is exactly one plane. 9. \overleftrightarrow{VY} , \overleftrightarrow{VX} , \overleftrightarrow{VZ} , \overleftrightarrow{VW} 11. \overleftrightarrow{WX} 15. *Sample:*

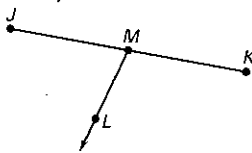


17. point R
19. \overleftrightarrow{RS}
21. yes; yes

23. *Sample:*



25. *Sample:*



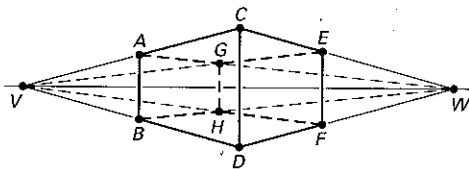
27. on the line 29. not on the line 31. on the line

33. ray

35. segment

1.1 Problem Solving (pp. 7-8) 41. intersection of a line and a plane 43. Four points are not necessarily coplanar; no; three points determine a unique plane.

45. a-c.

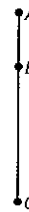


1.2 Skill Practice (pp. 12-13) 1. \overline{MN} means segment MN while MN is the length of \overline{MN} . 3. 2.1 cm 5. 3.5 cm 7. 44 9. 23 11. 13 13. congruent 15. not congruent 17. 7 19. 9 21. 10 23. 20 25. 30 29. $(3x - 16) + (4x - 8) = 60$; 12; 20, 40

1.2 Problem Solving (pp. 13-14)

33. a. 1883 mi b. about 50 mi/h

35. a. *Sample:*



1.3 Skill Practice (pp. 19-20) 1. Distance Formula

3. $10\frac{1}{4}$ in. 5. 26 cm 7. $4\frac{3}{4}$ in. 9. $2\frac{3}{8}$ in. 11. 10 13. 1

15. 70 17. (5, 5) 19. (1, 4) 21. $(1\frac{1}{2}, -1)$ 23. $(\frac{m}{2}, \frac{n}{2})$; when x_2 and y_2 are replaced by zero in the Midpoint Formula and x_1 and y_1 are replaced by m and n the result is $(\frac{m}{2}, \frac{n}{2})$. 25. (-3, 10) 27. (4, 8) 29. (-18, 22)

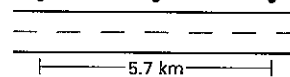
31. 4.5 33. 5.7 35. 7; $-\frac{1}{2}$ 37. 40; 5 39. 9; $-3\frac{1}{2}$

43. $AB = 3\sqrt{5}$, $CD = 2\sqrt{10}$; not congruent

45. $JK = 8\sqrt{2}$, $LM = \sqrt{130}$; not congruent

1.3 Problem Solving (pp. 21-22)

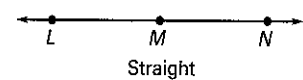
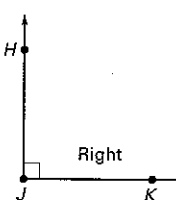
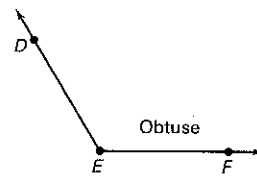
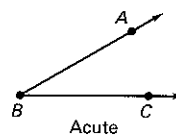
49. House Library School 2.85 km



51. objects B and D; objects A and C 53. a. 191 yd b. 40 yd c. About 1.5 min; find the total distance, about 230 yards, and divide by 150 yards per minute.

1.4 Skill Practice (pp. 28-31)

1. *Sample:*



3. $\angle ABC$, $\angle B$, $\angle CBA$; B , \overrightarrow{BA} , \overrightarrow{BC} 5. $\angle MTP$, $\angle T$, $\angle PTM$; T , \overrightarrow{TM} , \overrightarrow{TP} 7. straight 9. right 11. 90° ; right 13. 135° ; obtuse 15-19. *Sample answers are given.* 15. $\angle BCA$; right 17. $\angle DFB$; straight 19. $\angle CDB$; acute 23. 65° 25. 55° 29. $m\angle XWY = 104^\circ$, $m\angle ZWY = 52^\circ$