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MINISTRY OF EDUCATION

2023-2024

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MATH®

Integrated II
UAE Edition
Grade 10
Student Edition

Mc
Graw
Hill

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Grade	10
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Question* السؤال*		Learning Outcome/Performance Criteria** نتائج التعلم/ معايير الأداء**	Reference(s) in the Student Book (English Version) المرجع في كتاب الطالب (النسخة الانجليزية)	
			Example/Exercise مثال/تمرين	Page الصفحة
MCQ - الأسئلة الموضوعية	1	Multiply a polynomial by a monomial	1 to 16	641
	2	Multiply binomials by using the Distributive Property and the FOIL Method	18 to 59	650, 651
	3	Find squares of sums and differences	1 to 10	657
	4	Factor polynomials by using the Distributive Property.	1 to 10	665
	5	Factorize binomials that are the difference of squares	1 to 14	679
	6	Know the precise definition of circle and find the circumferences of circles.	1 to 15	227
	7	Find arc lengths and convert between degrees and radians	20 to 41	238
	8	Describe relationships between inscribed angles, and use those relationships to solve problems	1 to 12	251
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11	Find perimeters and areas of parallelograms	1 to 12	289
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17	Solve problems using the relationships between arcs, chords, and diameters	1 to 16	245
18	Find areas of composite figures	8 to 13	297
19	Write polynomials in standard form	1 to 14	635

Example 1

Simplify each expression.

1. $b(b^2 - 12b + 1)$

2. $f(f^2 + 2f + 25)$

3. $-3m^3(2m^3 - 12m^2 + 2m + 25)$

4. $2j^2(5j^3 - 15j^2 + 2j + 2)$

5. $2pr^2(2pr + 5p^2r - 15p)$

6. $4t^3u(2t^2u^2 - 10tu^4 + 2)$

Example 2
Simplify each expression.

7. $-3(5x^2 + 2x + 9) + x(2x - 3)$

8. $a(-8a^2 + 2a + 4) + 3(6a^2 - 4)$

9. $-4d(5d^2 - 12) + 7(d + 5)$

10. $-9g(-2g + g^2) + 3(g^3 + 4)$

11. $2j(7j^2k^2 + jk^2 + 5k) - 9k(-2j^2k^2 + 2k^2 + 3j)$

12. $4n(2n^3p^2 - 3np^2 + 5n) + 4p(6n^2p - 2np^2 + 3p)$

Example 3

13. **NUMBER THEORY** The sum of the first n whole numbers is given by the expression $\frac{1}{2}(n^2 + n)$. Expand the equation by multiplying, then find the sum of the first 12 whole numbers.

14. **COLLEGE** Troy's grandfather gave him $700 to start his college savings account. Troy's grandfather also gives him $40 each month to add to the account. Troy's mother gives him $50 each month, but has been doing so for 4 fewer months than Troy's grandfather. Write a simplified expression for the amount of money Troy has received from his grandfather and mother after m months.

15. MARKET Sophia went to the farmers' market to purchase some vegetables. She bought peppers and potatoes. The peppers were $0.39 each and the potatoes were $0.29 each. She spent $3.88 on vegetables, and bought 4 more potatoes than peppers. If $x =$ the number of peppers, write and solve an equation to find out how many of each vegetable Sophia bought.

16. GEOMETRY The volume of a pyramid can be found by multiplying the area of its base B by one-third of its height. The area of the rectangular base of a pyramid is given by the polynomial equation $B = x^2 - 4x - 12$.

a. Write a polynomial equation to represent the volume of the pyramid V if its height is 10 meters.
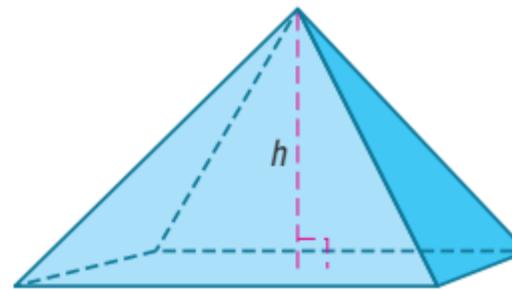
b. Find the volume of the pyramid if $x = 12$ m.

| 2 | Multiply binomials by using the Distributive Property and the FOIL Method | 18 to 59 | 650, 651 |

Example 5   Find each product.

18. $(2y - 11)(y^2 - 3y + 2)$

19. $(4a + 7)(9a^2 + 2a - 7)$

20. $(m^2 - 5m + 4)(m^2 + 7m - 3)$

21. $(x^2 + 5x - 1)(5x^2 - 6x + 1)$

22. $(3b^3 - 4b - 7)(2b^2 - b - 9)$

23. $(6z^2 - 5z - 2)(3z^3 - 2z - 4)$

24. $(m + 4)(m + 1)$

25. $(x + 2)(x + 2)$

26. $(b + 3)(b + 4)$

27. $(t + 4)(t - 3)$

28. $(r + 1)(r - 2)$

29. $(n - 5)(n + 1)$

30. $(3c + 1)(c - 2)$

31. $(2x - 6)(x + 3)$

32. $(d - 1)(5d - 4)$

33. $(2\ell + 5)(\ell - 4)$

34. $(3n - 7)(n + 3)$

35. $(q + 5)(5q - 1)$

36. $(3b + 3)(3b - 2)$

37. $(2m + 2)(3m - 3)$

38. $(4c + 1)(2c + 1)$

39. $(5a - 2)(2a - 3)$

40. $(4h - 2)(4h - 1)$

41. $(x - y)(2x - y)$

42. $(w + 4)(w^2 + 3w - 6)$

43. $(t + 1)(t^2 + 2t + 4)$

44. $(k - 4)(k^2 + 5k - 2)$

45. $(m + 3)(m^2 + 3m + 5)$

46. $(2x + 1)(x^2 - 3x - 4)$

47. $(3b + 4)(2b^2 - b + 4)$

Simplify.

48. $(m + 2)[(m^2 + 3m - 6) + (m^2 - 2m + 4)]$

49. $[(t^2 + 3t - 8) - (t^2 - 2t + 6)](t - 4)$

Find each product.

50. $(a - 2b)^2$

51. $(3c + 4d)^2$

52. $(x - 5y)^2$

53. $(2r - 3t)^3$

54. $(5g + 2h)^3$

55. $(4y + 3z)(4y - 3z)^2$

56. PRECISION Write each expression as a simplified polynomial.

a. $(3c - 2)(4c^2 - c^3 + 3)$

b. $(5x - y)(3x^2 - 2xy) + (2x + y)(y^2 - 4x^2)$

c. $-2x(3 - x^2)(2x + 4)$

d. $(z - 1)(2 - z)(z + 1)$

57. ART The museum where Julia works plans to have a large wall mural painted in its lobby. First, Julia wants to paint a large frame around where the mural will be. She only has enough paint for the frame to cover 100 square feet of wall surface. The mural's length will be 5 feet longer than its width, and the frame will be 2 feet wide on all sides.

a. Write an expression for the area of the mural.
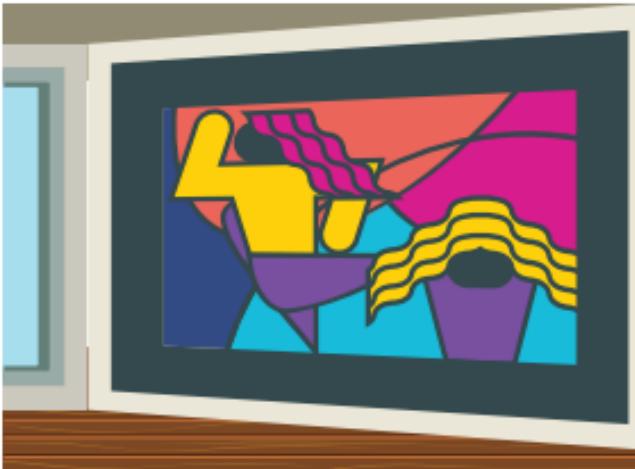
b. Write an expression for the area of the frame.

c. Write and solve an equation to find how large the mural can be.

58. STRUCTURE The dimensions of the composite figure shown are given in terms of the triangle's height, h.

a. Write and simplify a quadratic expression for the area of the figure.

h

$5 - 2h$

$4h + 2$
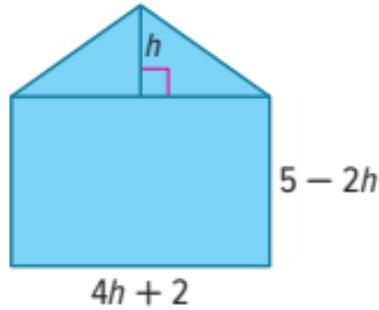
b. If $h = 1.42$ units, what is the area of the figure? Round to the nearest hundredth, if necessary.

59. STRUCTURE Consider the expression $x^{4p+1}(x^{1-2p})^{2p+3}$.

a. Use the laws of exponents to simplify the expression.

b. Find any integer values of p that make this expression equal to 1 for all values of x.

Examples 1 and 3   **Find each product.**

1. $(a + 10)(a + 10)$

2. $(b - 6)(b - 6)$

3. $(h + 7)^2$

4. $(x + 6)^2$

5. $(8 - m)^2$

6. $(9 - 2y)^2$

7. $(2b + 3)^2$

8. $(5t - 2)^2$

9. $(8h - 4n)^2$

10. $(4m - 5n)^2$

| 4 | Factor polynomials by using the Distributive Property. | 1 to 10 | 665 |

Example 1 Use the Distributive Property to factor each polynomial.

1. $16t - 40y$

2. $30v + 50x$

3. $2k^2 + 4k$

4. $5z^2 + 10z$

5. $4a^2b^2 + 2a^2b - 10ab^2$

6. $5c^2v - 15c^2v^2 + 5c^2v^3$

Example 2

7. **PHYSICS** The distance d an object falls after t seconds is given by $d = 16t^2$ (ignoring air resistance). To find the height of an object launched upward from ground level at a rate of 32 feet per second, use the expression $32t - 16t^2$, where t is the time in seconds. Factor the expression.

8. **SWIMMING POOL** The area of a rectangular swimming pool is given by the expression $12w - w^2$, where w is the width of one side. Factor the expression.

9. VERTICAL JUMP Your vertical jump height is measured by subtracting your standing reach height from the height of the highest point you can reach by jumping without taking a running start. Typically, NBA players have vertical jump heights of up to 34 inches. If an NBA player jumps this high, his height in inches above his standing reach height after t seconds can be modeled by the expression $162t - 192t^2$. Factor the expression.

10. PETS Conner is playing with his dog. He tosses a treat upward with an initial velocity of 13.7 meters per second. His hand starts at the same height as the dog's mouth, so the height of the treat above the dog's mouth in meters after t seconds is given by the expression $13.7t - 4.9t^2$. Factor the expression.

5	Factorize binomials that are the difference of squares	1 to 14	679

Examples 1 and 2

1. $q^2 - 121$

2. $r^4 - k^4$

3. $w^4 - 625$

4. $r^2 - 9t^2$

5. $h^4 - 256$

6. $2x^3 - x^2 - 162x + 81$

7. $x^2 - 4y^2$

8. $3c^3 + 2c^2 - 147c - 98$

9. $f^3 + 2f^2 - 64f - 128$

10. $r^3 - 5r^2 - 100r + 500$

11. $3t^3 - 7t^2 - 3t + 7$

12. $a^2 - 49$

13. $4m^3 + 9m^2 - 36m - 81$

14. $3x^3 + x^2 - 75x - 25$

Example 1   For Exercises 1–3, refer to the circle at the right.

1. Name the circle.

2. Name the radii of the circle.

3. Name the chords of the circle.
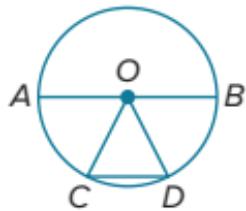
For Exercises 4–8, refer to the circle at the right.

4. Name the circle.

5. Name the radii of the circle.

6. Name the chords of the circle.

7. Name a diameter of the circle.

8. Name a radius not drawn as part of a diameter.
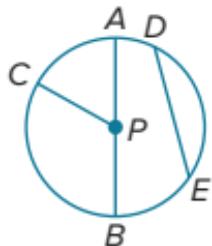
Example 2   For Exercises 9–11, refer to ⊙R.

For Exercises 9–11, refer to ⊙R.

9. If $AB = 18$ millimeters, find AR.

10. If $RY = 10$ inches, find AR and AB.

11. Is $\overline{AB} \cong \overline{XY}$? Explain.
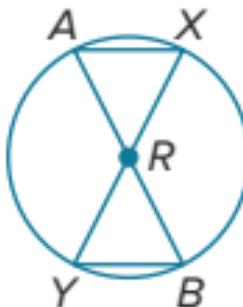
For Exercises 12–14, refer to ⊙L.

12. Suppose the radius of the circle is 3.5 yards. Find the diameter.

13. If $RT = 19$ meters, find LW.

14. If $LT = 4.2$ inches, what is the diameter of ⊙L?
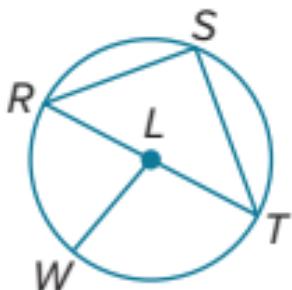
Example 3

15. **TIRES** A bicycle has tires with a diameter of 26 inches. Find the radius and circumference of each tire. Round your answer to the nearest hundredth, if necessary.

Example 5

Use ⊙D to find the length of each arc to the nearest hundredth. $\overline{NL}$ is a diameter.

20. $\overarc{LM}$ if the radius is 5 inches

21. $\overarc{MN}$ if the diameter is 3 yards
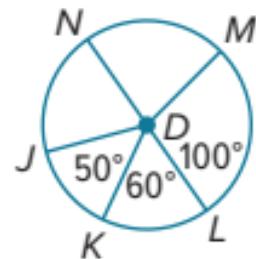
22. $\overarc{KL}$ if $JD = 7$ centimeters

23. $\overarc{NJK}$ if $NL = 12$ feet

24. $\overarc{KLM}$ if $DM = 9$ millimeters

25. $\overarc{JK}$ if $KD = 15$ inches

Example 6

Write each degree measure in radians as a multiple of π.

26. 120°   **27.** 45°   **28.** 30°   **29.** 90°

30. 180°   **31.** 225°

Example 7

Write each radian measure in degrees.

32. $\frac{3\pi}{4}$ radians

33. $\frac{3\pi}{2}$ radians

34. $\frac{\pi}{3}$ radians

35. $\frac{5\pi}{6}$ radians

36. 2π radians

37. $\frac{\pi}{12}$ radians

Example 8

Use ⊙Z to find the length of each arc to the nearest hundredth.

38. $\overgroup{QR}$, if $PZ = 12$ feet

39. $\overgroup{ST}$, if $SZ = 8$ inches

40. $\overgroup{PQ}$, if $TZ = 14$ centimeters

41. $\overgroup{PT}$, if $TR = 20$ inches
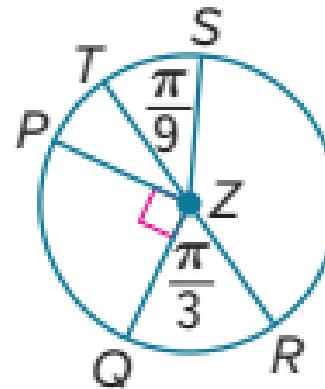
Example 1

Find each measure.

1. $m\overset{\frown}{AC}$
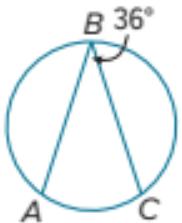
2. $m\angle N$
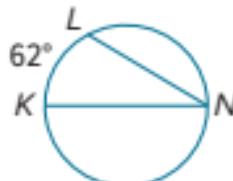
3. $m\overset{\frown}{QSR}$
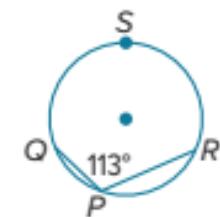
4. $m\overset{\frown}{XY}$
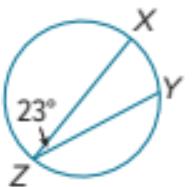
5. $m\angle E$
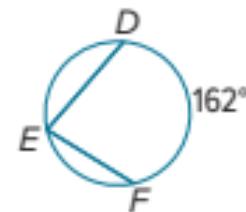
6. $m\angle R$
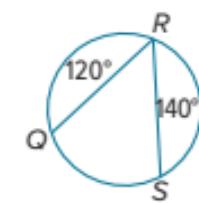
Example 2

Find each measure.

7. $m\angle N$

8. $m\angle L$

$(5x + 9)°$ $(6y - 1)°$

L

M

P

$(6x)°$

N

$(3y + 8)°$

9. $m\angle C$

10. $m\angle A$

$(5x - 1)°$ $(4x + 17)°$

A

B

C

$(3y - 20)°$

D

$(2y + 1)°$
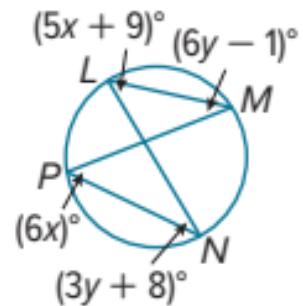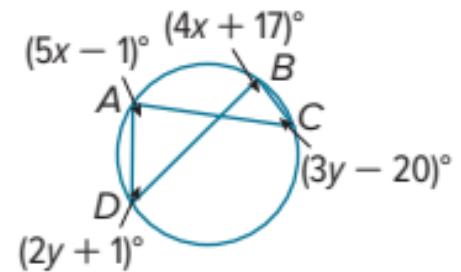
Example 3

PROOF Write the specified type of proof.

11. paragraph proof

Given: $m\angle T = \frac{1}{2} m\angle S$

Prove: $m\widehat{TUR} = 2m\widehat{URS}$
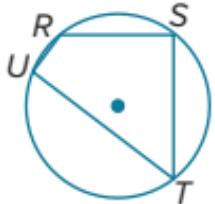
12. two-column proof

Given: $\odot C$

Prove: $\triangle KML \sim \triangle JMH$

| 9 | Identify relationships in inscribed polygons, and use those relationships to solve problems | 13 to 25 | 252 |
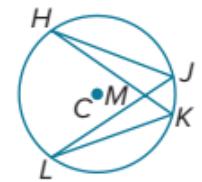
Example 4

Find each value.

13. x

14. $m\angle W$

$(x + 12)°$ at Y, $x°$ at X, with W labeled

15. x

16. $m\angle T$

$(2x)°$ at R, $(4x - 6)°$ at T, with S labeled

17. $m\angle J$

18. $m\angle K$

$(5x - 2)°$ at J, $(2x + 8)°$ at K, with H and B labeled

19. $m\angle A$

20. $m\angle C$

$(3x + 6)°$ at A, $x°$ at C, with P and B labeled
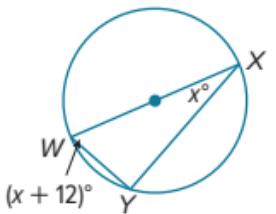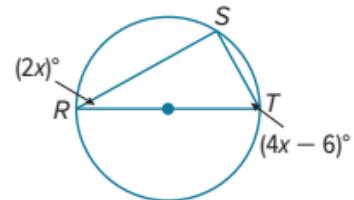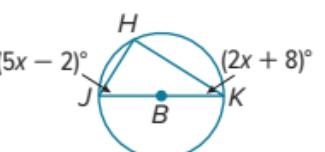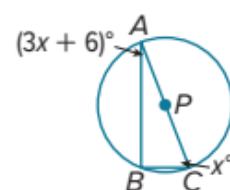
Example 5

Find each measure.

21. $m\angle R$
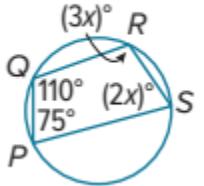
22. $m\angle S$

23. $m\angle W$

24. $m\angle X$
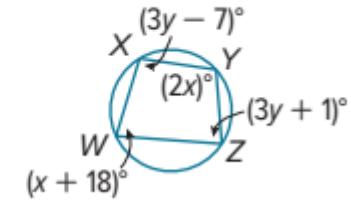
25. **USE ESTIMATION** Darius bought a circular picture frame with a geometric design. The frame has a quadrilateral inscribed in a circle.

a. Estimate the value of x.
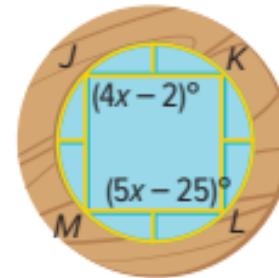
b. Find the exact value of x and $m\angle J$.

c. Is your answer reasonable? Justify your argument.

| 10 | Solve problems involving circumscribed polygons | 19 to 26 | 260 |

Example 5

19. If $m\angle BDC = 12x°$ and $m\angle A = (4x + 4)°$, find $m\angle A$.
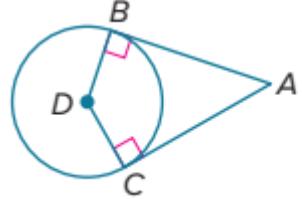
20. If $m\angle QPS = (15x + 8)°$ and $m\angle R = (10x - 3)°$, find $m\angle R$.
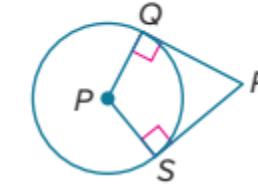
Example 6

Each polygon is circumscribed about a circle. Find the perimeter of each polygon.

21.
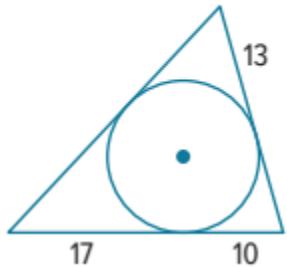
22.
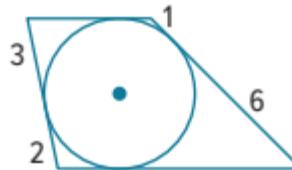
23.
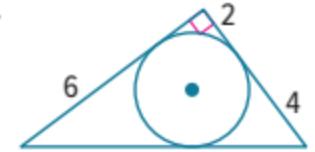
Each polygon is circumscribed about a circle. Find the value of x. Then find the perimeter of each polygon.

24.
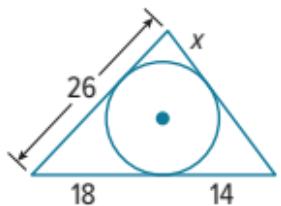
25.
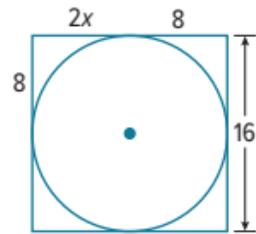
26.
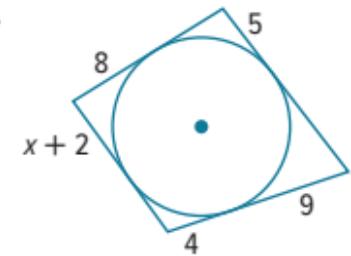
11	Find perimeters and areas of parallelograms	1 to 12	289
12	Find the areas of kites and rhombi	1 to 12	289

Examples 1, 2, 4–6

Find the area of each parallelogram, trapezoid, rhombus, or kite. Round to the nearest tenth, if necessary.

1.

12 m

9 m

2.

←22 cm→

26 cm

10 cm

3.

5.5 ft

4 ft

60°

4.

14 yd

7 yd

45°

5

5.

18 mm

15 mm

24 mm

6.

8 in.

10 in.

9 in.　　6 in.

7.

8 m

8 m

45°

8. 11 m

12 m

9.

25 ft

14 ft

10.

6 cm

9 cm

|← 7 cm →|

11.

11 ft

25 ft

12.

8 in.

17 in.
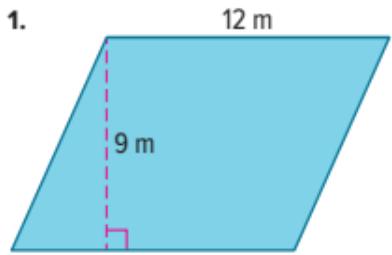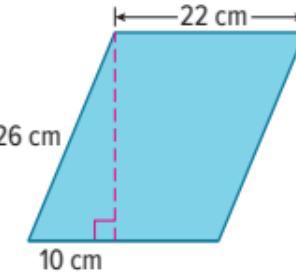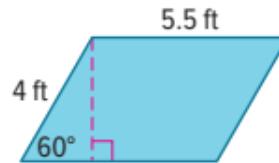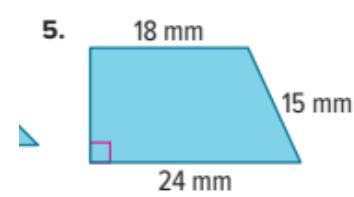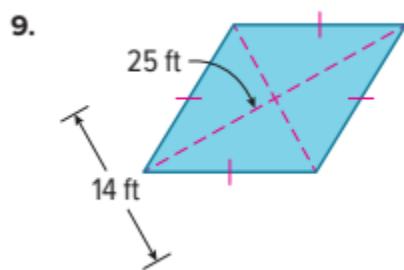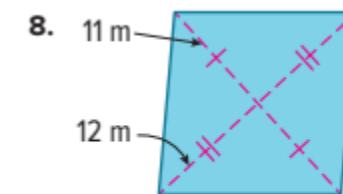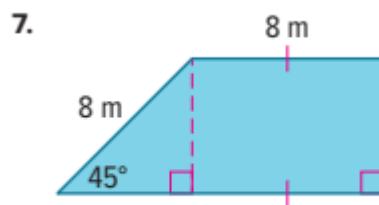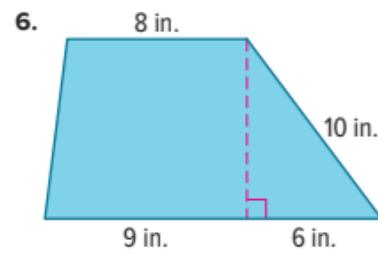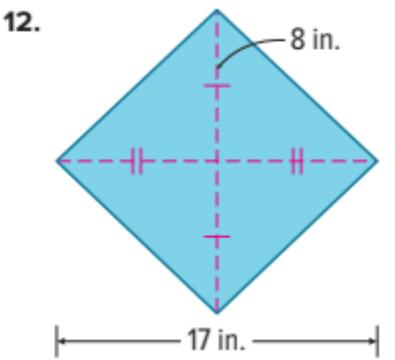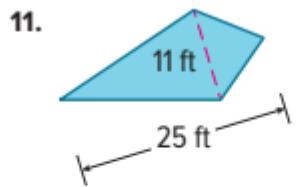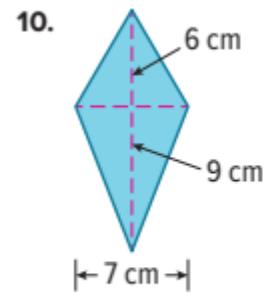
Example 1

Find the area of each circle. Round to the nearest tenth.

1.

7 m

2.

18 in.

3.

10.5 m
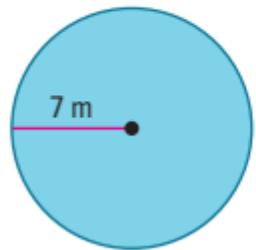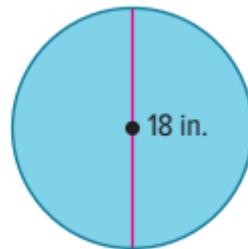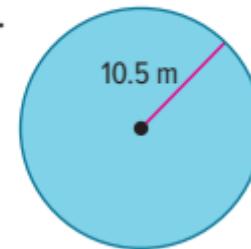
4. DINING Maricela is making a tablecloth for a circular table that has a diameter of 8 feet.

   a. Find the area of the tabletop. Round your answer to the nearest tenth.

   b. If a square yard of fabric costs $13.99, what is the minimum Maricela will need to spend to make the tablecloth?

5. GAMES Kiyoshi is making circular tiles to display houses for his role-playing game. Each tile has a radius of 2 inches and is being made out of balsa wood that costs $1.99 per square foot.

    a. Find the area of a single tile. Round your answer to the nearest tenth.

    b. How much will it cost Kiyoshi to make 30 tiles?

6. PORTHOLES A circular window on a ship is designed with a radius of 8 inches. What is the area of glass needed for the window? Round your answer to the nearest hundredth.

Example 2

Find the indicated measure. Round to the nearest tenth.

7. Find the diameter of a circle with an area of 94 square millimeters.

8. The area of a circle is 132.7 square centimeters. Find the diameter of the circle.

9. The area of a circle is 112 square inches. Find the radius of the circle.

10. Find the diameter of a circle with an area of 1134.1 square millimeters.

11. The area of a circle is 706.9 square inches. Find the radius of the circle.

12. Find the radius of a circle with an area of 2827.4 square feet.

14	Find surface areas of prisms and cylinders	1 to 16	315, 316
	Find surface areas of pyramids and cones		

Find the lateral area and surface area of each solid. Round to the nearest tenth, if necessary.

1.

12 yd
12 yd   10 yd

2.

5 m

14 m

3.

15 cm
3 cm
8 cm

4.   12 ft

14 ft

5. 7.8 cm   9 cm
9 cm
12 cm
9 cm

6. 24 mm
14 mm

7. 10 in.
12 in.

8. 20 in.
8 in.

9.

12 yd

6 yd

10. 10 ft

25 ft

11.

8 in.

12 in.

12.

8 in.

6 in.
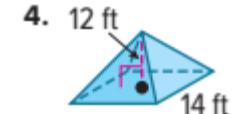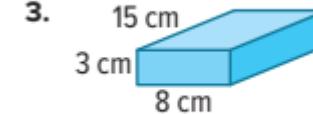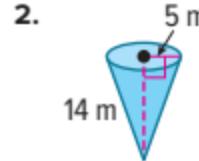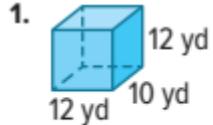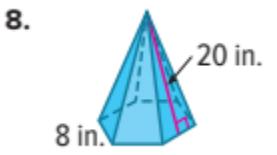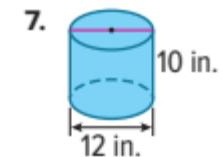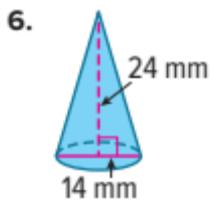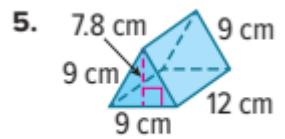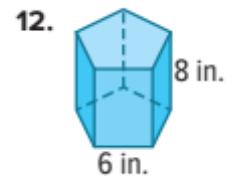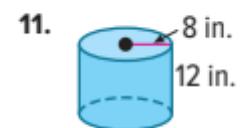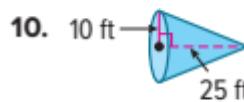
13. PAINTING Greg is painting the four walls of his bedroom and the ceiling.

    a. If the height of the walls is x and the edge length of the square ceiling is $2x$, approximate the surface area Greg will be painting in terms of x.

    b. Approximate the surface area that will be painted to the nearest tenth if $x = 8$ feet.

14. MANUFACTURING A food distribution manufacturer is developing a new cylindrical package with a cardboard bottom and sides and a plastic lid. They are evaluating the cost of manufacturing based on the amount of cardboard used.

    a. If the radius of the package is x and the height is $x + 4$, approximate the surface area of the package that will be cardboard in terms of x and π.

    b. Approximate the surface area of the package that will be cardboard to the nearest tenth if $x = 6$ centimeters.

15. CAMPING A company that manufactures camping gear is designing a new tent shaped like a square pyramid with sidewalls made of a waterproof material.

a. If the base of the tent is x units long and the slant height of the walls is 1.5x units, approximate the surface area of the sidewalls in terms of x.

b. Approximate the amount of material needed to manufacture the sidewalls if $x = 9$ feet.

16. TOPIARY Davea is planning to prune her landscaping bushes into topiaries shaped like cones.

a. The radius of a bush is $\frac{1}{2}x$ units and the slant height is 4x units. Approximate the lateral area of one topiary in terms of x and π.

b. A frost is expected, and Davea is making plastic slipcovers to protect her new topiaries. Approximate the surface area of one slipcover to the nearest tenth if the slipcover does not cover the base of the topiary and $x = 0.75$ meter.

15	Identify the shapes of all cross sections formed by cuts to a solid.	1 to 7	323

Example 1

Describe each plane of symmetry for each solid.

1.

2.
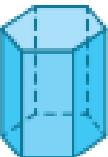
3.
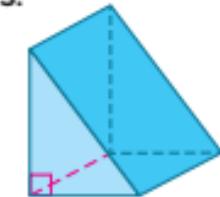
Example 2

Example 2

Identify the shape of each cross section.

4.

5.

6.

7.

16	Find measures in intersecting circles and prove relationships between circles	33 to 51	229, 230
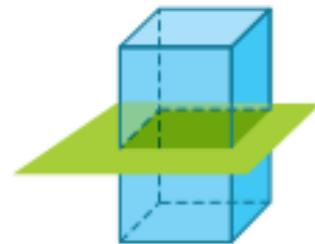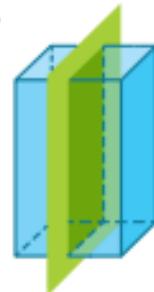
Determine whether the circles in the figures below appear to be *congruent*, *concentric*, or *neither*.

33.

34.

35.

For each circle, find the exact circumference in terms of π.

36.

8 cm

6 cm

37.

9 in

38.

3 mm

7 mm

39.

11 yd

40.

5 cm

12 cm

41.

$\sqrt{2}$ cm

$\sqrt{2}$ cm
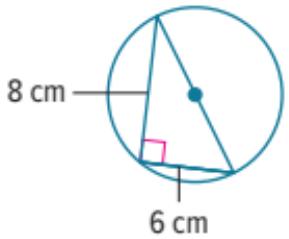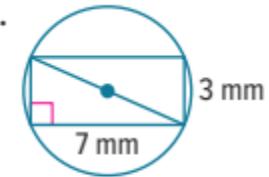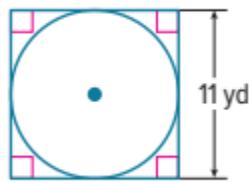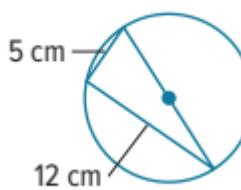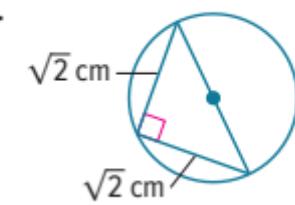
42. PROOF Write a paragraph proof to prove Theorem 5.1.

    Given: $\odot D$ and $\odot E$

    Prove: $\odot D \sim \odot E$

43. USE A SOURCE Go online to research a famous clock face. Then use the diameter of the clock face to find the circumference. Round your answer to the nearest hundredth.

44. WHEELS Zack is designing wheels for a concept car. The diameter of the wheel is 18 inches. Zack wants to make spokes in the wheel that run from the center of the wheel to the rim. In other words, each spoke is a radius of the wheel. How long are these spokes?

45. PRECISION Kathy slices through a circular cake. The cake has a diameter of 14 inches. The slice that Kathy made is straight and has a length of 11 inches. Did Kathy cut along a *radius*, a *diameter*, or a *chord* of the circle?

46. REASONING Three identical circular coins are lined up in a row as shown. The distance between the centers of the first and third coins is 3.2 centimeters. What is the radius of one of these coins?

|←3.2 cm→|

47. EXERCISE HOOPS Taiga wants to make a circular hoop that he can twirl around his body for exercise. He will use a tube that is 2.5 meters long.

a. What will be the diameter of Taiga's exercise hoop? Round your answer to the nearest thousandth of a meter.

b. What will be the radius of Taiga's exercise hoop? Round your answer to the nearest thousandth of a meter.

48. WRITE How can we describe the relationships that exist between circles and line segments?

49. PERSEVERE The sum of the circumferences of circles H, J, and K shown at the right is 56π units. Find KJ.
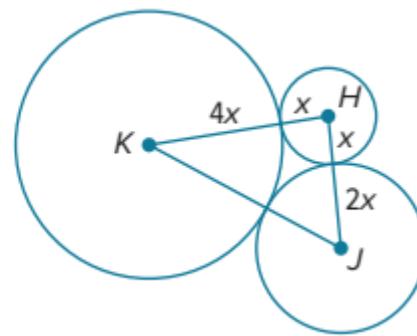
50. ANALYZE Is the distance from the center of a circle to a point in the interior of a circle *sometimes*, *always*, or *never* less than the radius of the circle? Justify your argument.

51. CREATE Design a sequence of transformations that can be used to prove that ⊙*D* is similar to ⊙*E*.

17	Solve problems using the relationships between arcs, chords, and diameters	1 to 16	245
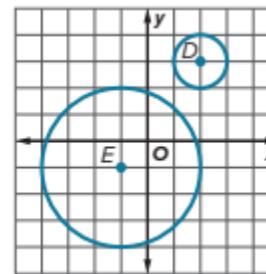
Examples 1 and 2

REGULARITY Find the value of *x*.

1.

2.

3.

4.

5.

6.

6.

J 115°
2x + 1
5x − 5   •   H
I   115°

7.

P (2x + 4)°
6
•   M
6
N (3x + 2)° L

8. ⊙M ≅ ⊙P

6x
•
M

P•
2x + 24

9. ⊙V ≅ ⊙W

162°
9x − 78 U
T   •   V

Z
3x   •   198°
W
Y
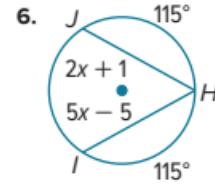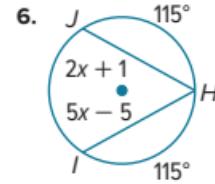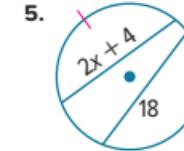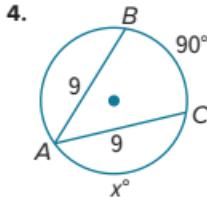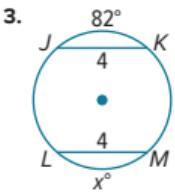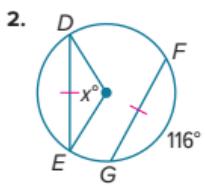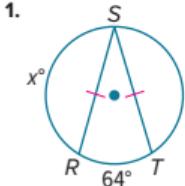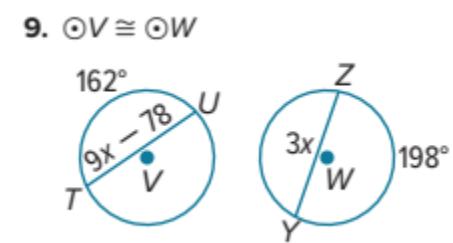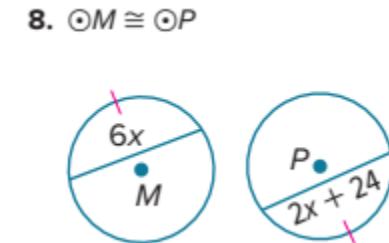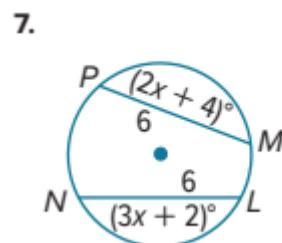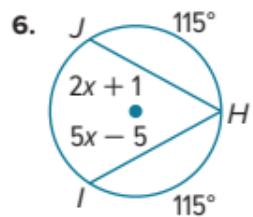
In ⊙P, PQ = 13 and RS = 24. Find each measure.

10. *RT*   **11.** *PT*   **12.** *TQ*
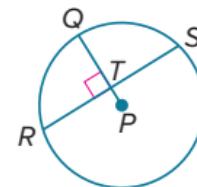
16. USE A MODEL For security purposes a jewelry company prints a hidden watermark on the logo of its official documents. The watermark is a chord located 0.7 cm from the center of a circular ring that has a 2.5 cm radius. To the nearest tenth, what is the length of the chord?

In ⊙A, EB = 12, CD = 8, and m$\overset{\frown}{CD}$ = 90°. Find each measure. Round to the nearest hundredth, if necessary.

13. m$\overset{\frown}{DE}$ **14.** *FD*   **15.** *AF*

| 18	Find areas of composite figures	8 to 13	297
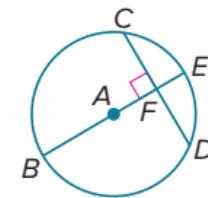
Examples 3 and 4

Find the area of each figure. Round to the nearest tenth, if necessary.

8.

5 m
12 m
20 m

**9.**

11 cm
14 cm
11 cm
25 cm

10.
$4\sqrt{3}$ in.

8 in.
6 in.

11.

6 cm

12.

6 cm
6 cm
6 cm
11 cm

13.

12 in.
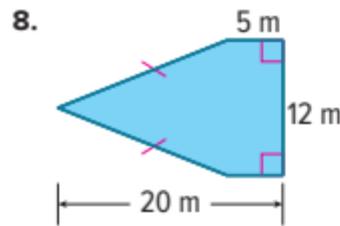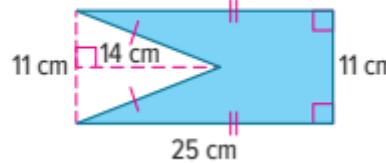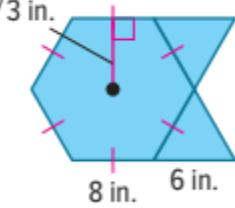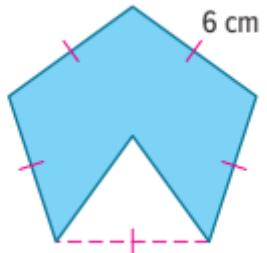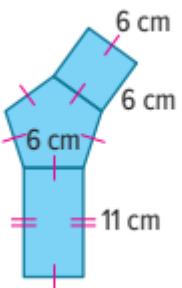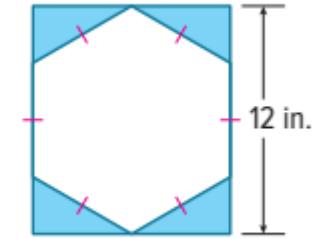
Example 1

Determine whether each expression is a polynomial. If it is a polynomial, find the degree and determine whether it is a *monomial, binomial,* or *trinomial.*

1. $\dfrac{5y^3}{x^2} + 4x$

2. 21

3. $c^4 - 2c^2 + 1$

4. $d + 3d^c$

5. $a - a^2$

6. $5n^3 + nq^3$

Example 2

Write each polynomial in standard form. Identify the leading coefficient.

7. $5x^2 - 2 + 3x$

8. $8y + 7y^3$

9. $4 - 3c - 5c^2$

10. $-y^3 + 3y - 3y^2 + 2$

11. $11t + 2t^2 - 3 + t^5$

12. $2 + r - r^3$

13. $\frac{1}{2}x - 3x^4 + 7$

14. $-9b^2 + 10b - b^6$