Practice 4: reasoning

48 original fixed-form questions with worked explanations. This is not an official Florida released test, an adaptive assessment or a scale-score predictor.

Study rehearsal: 160 minutes, with a short break after 80 minutes if practising the published session format. Follow your school's actual directions for the examination.

One local point per item. Multi-select requires all correct selections and no incorrect selection. Numerical items specify their units or coefficient. Complete the question section before opening the answer section.

Blueprint practice balance: Category 1, 17 items; Category 2, 14 items; Category 3, 17 items.

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1. Lines and angles · Category 1

Two parallel lines are cut by a transversal. A corresponding angle is $65°$. What is the other corresponding angle in degrees?

A. 130

B. 45

C. 65

D. 115

Choose one response.

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2. Triangles and quadrilaterals · Category 1

A triangle has interior angles $40°$ and $75°$. Find its third angle in degrees.

Write the requested numeric value.

3. Congruence · Category 1

For triangle pair 5, both triangles are right triangles, with congruent hypotenuses and one pair of congruent legs. Which criterion directly establishes congruence?

A. HL

B. SSS

C. SAS

D. ASA

Choose one response.

4. Triangles and quadrilaterals · Category 1

One interior angle of a parallelogram is 75°. Find the adjacent interior angle in degrees.

Write the requested numeric value.

5. Triangles and quadrilaterals · Category 1

A trapezoid has bases 11 cm and 27 cm. Find its midsegment length in cm.

Write the requested numeric value.

6. Circles · Category 1

An inscribed angle intercepts a minor arc of 110°. Find the inscribed angle in degrees.

Write the requested numeric value.

7. Circles · Category 1

A radius-35 circle has a chord whose perpendicular distance from the center is 21. Find the full chord length.

Write the requested numeric value.

8. Circles · Category 1

A quadrilateral is inscribed in a circle. One angle is 110°. Find its opposite angle in degrees.

Write the requested numeric value.

9. Circles · Category 1

A circle has circumference 28π. Find the length of its 90° arc as a coefficient of π.

Write the requested numeric value.

10. Logic and proofs · Category 1

Consider: If a figure or number is a square, then it is a rhombus. Which is its contrapositive?

A. It is both a square and a rhombus.

B. If it is not a rhombus, then it is not a square.

C. If it is a rhombus, then it is a square.

D. If it is not a square, then it is not a rhombus.

Choose one response.

11. Logic and proofs · Category 1

Claim 5: Every rectangle is a square. Which rectangle is a counterexample?

A. 7 by 9

B. 7 by 7

C. 8 by 8

D. 9 by 9

Choose one response.

12. Triangles and quadrilaterals · Category 1

A triangle exterior angle is $125°$, and one remote interior angle is $45°$. Find the other remote interior angle in degrees.

Write the requested numeric value.

13. Triangles and quadrilaterals · Category 1

The diagonals of a parallelogram meet at M. One diagonal has length 28. Find the distance from M to either endpoint of that diagonal.

Write the requested numeric value.

14. Circles · Category 1

Two tangent segments from point P touch a circle. One is 23 units long. How long is the other?

A. 21

B. 23

C. 46

D. 9

Choose one response.

15. Lines and angles · Category 1

A linear pair consists of angles $4x°$ and $(2x + 30)^\circ$. Find x.

Write the requested numeric value.

16. Circles · Category 1

An inscribed angle intercepting minor arc AB is 60°. In the same circle of radius 21, find the area of the sector with minor arc AB as a coefficient of π.

Write the requested numeric value.

17. Circles · Category 1

A triangle has one side that is a diameter of its circumcircle. The third vertex is on the circle. Its other two angles are x° and $(6x)^\circ$. Select the missing reason: the angle opposite the diameter is 90° because it is ___.

A. opposite a radius

B. part of a linear pair

C. inscribed in a semicircle

D. a central angle

Choose one response.

18. Similarity · Category 2

Two similar triangles have area ratio $4:9$ from small to large. A side of the smaller triangle is 28. Find the corresponding larger side.

Write the requested numeric value.

19. Transformations · Category 2

Point A is $(5, 7)$. A translation moves it 7 units right and 5 units down. Enter image coordinates as x,y.

Enter coordinates x,y.

20. Transformations · Category 2

A figure is translated 7 units, reflected, rotated 90°, or dilated by factor 6. Select every move that always preserves its lengths.

A. reflection

B. rotation

C. dilation by 6

D. translation

Select all required answers; all-or-nothing local practice scoring.

21. Transformations · Category 2

Point P is $(7, 5)$. Reflect across the x-axis, then translate 5 units left. Enter final x,y.

Enter coordinates x,y.

22. Transformations · Category 2

Plot in words by entering coordinates: rotate point $(7, 5)$ 90° counterclockwise about the origin. Enter x,y.

Enter coordinates x,y.

23. Congruence · Category 2

Triangle T is translated 7 units right, then rotated 180°. Which conclusion follows from these moves alone?

A. The image is congruent to T.

B. Every side doubles.

C. The image has half the area.

D. The triangles cannot be congruent.

Choose one response.

24. Similarity · Category 2

Triangle R is dilated about a vertex by factor 6, then reflected. Select the strongest guaranteed size-and-shape conclusion.

A. It is always congruent.

B. Its angles double.

C. Its side ratios no longer match.

D. It is similar but not congruent to its preimage.

Choose one response.

25. Similarity · Category 2

A square design is enlarged by linear scale factor 6. Its original area is 49. Find the enlarged area.

Write the requested numeric value.

26. Constructions · Category 2

To copy a segment of length 7 without using measurement marks, what compass setting must be transferred?

A. The distance from the new point to the page edge.

B. The distance between the original segment endpoints.

C. Half the original distance.

D. Any convenient radius.

Choose one response.

27. Constructions · Category 2

Segment AB is 14 units long. Equal-radius arcs from A and B intersect above and below it. The line through the intersections is its perpendicular bisector. Which statements must be true?

A. It passes through the midpoint.

B. It is perpendicular to AB.

C. It must pass through A.

D. It must be parallel to AB.

Select all required answers; all-or-nothing local practice scoring.

28. Constructions · Category 2

Triangle 5 needs a circle touching all three sides. Which center construction is appropriate?

A. Intersect the perpendicular side bisectors.

B. Use any vertex.

C. Use the midpoint of the longest side.

D. Intersect the internal angle bisectors.

Choose one response.

29. Similarity · Category 2

Similar solid models have length scale factor 6 from small to large. The small volume is 7. Find the large volume.

Write the requested numeric value.

30. Transformations · Category 2

After reflecting point $(7,\ -5)$ across $y = x$, which plotted coordinate is correct?

A. $(-7, 5)$

B. $(-5, 7)$

C. $(5, 7)$

D. $(7, 5)$

Choose one response.

31. Similarity · Category 2

A 7-metre pole casts a 14-metre shadow. At the same sun angle a tree casts a 42-metre shadow on level ground. Find the tree height in metres.

Write the requested numeric value.

32. Coordinates · Category 3

A triangle has a median from $A(0, 0)$ to midpoint $M(21, 28)$ of its opposite side. Find the median length.

Write the requested numeric value.

33. Coordinates · Category 3

Find the midpoint of $A(-7, 5)$ and $B(21, 9)$. Enter x,y.

Enter coordinates x,y.

34. Coordinates · Category 3

On a number line, P lies one-quarter of the way from $A = 5$ to $B = 33$. Find P.

Write the requested numeric value.

35. Coordinates · Category 3

A coordinate rectangle has vertices $(0, 0)$, $(14, 0)$, $(14, 8)$, $(0, 8)$. Find its area.

Write the requested numeric value.

36. Measurement · Category 3

A right circular cone is cut by a plane through its apex and the center of its base. Choose the most specific shape guaranteed by this description.

A. circle

B. rectangle

C. square

D. isosceles triangle

Choose one response.

37. Measurement · Category 3

A rectangle 7 by 10 is rotated about its side of length 10. Which solid is formed?

A. sphere

B. pyramid

C. cylinder

D. cone

Choose one response.

38. Measurement · Category 3

A 28 by 21 rectangular floor contains a square opening of side 7. Find the remaining floor area.

Write the requested numeric value.

39. Measurement · Category 3

A cylindrical tank has diameter 14 and perpendicular height 9. It is filled to three quarters of that height. Find the liquid volume as a coefficient of π.

Write the requested numeric value.

40. Measurement · Category 3

A closed cylinder has radius 7 and height 9. Find its total surface area as a coefficient of π.

Write the requested numeric value.

41. Circle equations · Category 3

A circle has center $(5, -7)$ and radius 8. Select its equation.

A. $(x-5)^2+(y+7)^2=8$

B. $(x-5)^2+(y-7)^2=64$

C. $(x-5)^2+(y+7)^2=64$

D. $(x+5)^2+(y-7)^2=64$

Choose one response.

42. Circle equations · Category 3

The equation $(x+7)^2+(y-5)^2=81$ models a circular boundary. Find its radius.

Write the requested numeric value.

43. Right triangles · Category 3

A right triangle has hypotenuse 17 and an acute angle 50°. Find the opposite leg, rounded to the nearest hundredth.

Write the requested numeric value.

44. Right triangles · Category 3

A right triangle has legs 21 and 28 and hypotenuse 35. For the angle opposite the 21 leg, which ratio equals its sine?

A. $\frac{4}{5}$

B. $\frac{3}{4}$

C. $\frac{5}{3}$

D. $\frac{3}{5}$

Choose one response.

45. Measurement · Category 3

A cone has radius 21 and perpendicular height 8. Find its volume as a coefficient of π.

Write the requested numeric value.

46. Measurement · Category 3

A region has population 8400 and area 21 square kilometres. Find population density in people per square kilometre.

Write the requested numeric value.

47. Coordinates · Category 3

One side of a parallelogram has slope $\frac{7}{8}$. Which slope must its opposite parallel side have?

A. $\frac{7}{8}$

B. $\frac{-8}{7}$

C. $\frac{-7}{8}$

D. $\frac{8}{7}$

Choose one response.

48. Circle equations · Category 3

Complete both squares in $x^2 - 14x + y^2 + 10y = 122$. Find the radius of the resulting circle.

Write the requested numeric value.

Practice 4: reasoning · solutions

1. Answer: 65

1. Corresponding angles are congruent when the two lines are parallel.
2. Set the unknown angle equal to $65°$, rather than taking its supplement.
3. Answer: $65°$. A linear-pair neighbour would instead be $115°$.

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2. Answer: 65

1. The three interior angles sum to $180°$.
2. $180 - 40 - 75 = 65$.
3. The three positive angles sum back to $180°$.

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3. Answer: HL

1. A congruence criterion must include every required condition, with correct correspondence.
2. The stated information is exactly the HL package.
3. The right-angle condition is essential for HL.

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4. Answer: 105

1. Consecutive parallelogram angles are supplementary.
2. $180 - 75 = 105$.
3. Opposite, rather than adjacent, angles would be congruent.

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5. Answer: 19

1. The segment joining the leg midpoints is the average of the parallel bases.
2. $\frac{11 + 27}{2} = 19$.
3. The result lies between the two base lengths.

6. Answer: 55

1. An inscribed angle measures half its intercepted arc.
2. $\frac{110}{2} = 55.$
3. A central angle on that same arc would equal the full arc measure.

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7. Answer: 56

1. A perpendicular from the center bisects a chord. The radius is the hypotenuse of the right triangle formed with the half-chord and the perpendicular distance.
2. Half-chord: $\sqrt{35^2 - 21^2} = 28.$
3. The full chord is $2 \times 28 = 56.$

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8. Answer: 70

1. Opposite angles of a cyclic quadrilateral are supplementary.
2. $180 - 110 = 70.$
3. The rule depends on all four vertices lying on the circle.

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9. Answer: 7

1. A full circumference is 28π.
2. A 90° arc is one quarter of the circumference, so its length is 7π.
3. Enter the coefficient 7; no decimal approximation to π is needed.

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10. Answer: If it is not a rhombus, then it is not a square.

1. Write the original as if P, then Q.
2. The contrapositive reverses and negates both parts: if not Q, then not P.
3. It is logically equivalent to the original conditional.

11. Answer: 7 by 9

1. A counterexample must satisfy the hypothesis and fail the conclusion.
2. A rectangle with unequal adjacent side lengths is not a square.
3. 7 by 9 is a rectangle but has unequal adjacent sides.

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12. Answer: 80

1. An exterior triangle angle equals the sum of the remote interior angles.
2. Unknown angle: $125 - 45 = 80$.
3. Do not subtract the remote angle from $180°$; the given exterior angle supplies the sum.

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13. Answer: 14

1. Parallelogram diagonals bisect each other.
2. $\frac{28}{2} = 14$.
3. This uses bisection; the two complete diagonals need not have equal lengths.

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14. Answer: 23

1. Tangent segments from the same external point are congruent.
2. Both tangent lengths therefore equal 23.
3. The shared external point is the condition that makes this equality valid.

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15. Answer: 25

1. A linear pair sums to $180°$.
2. $4x + 2x + 30 = 180$, so $6x = 150$.
3. $x = 25$. The actual angle measures are $100°$ and $80°$.

16. Answer: 147

1. The intercepted arc and its central angle measure twice the inscribed angle, giving $120°$.
2. Sector area = $(\frac{120}{360})\pi(21)^2 = 147\pi$.
3. Enter the coefficient 147, in square units per π.

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17. Answer: inscribed in a semicircle

1. A diameter determines a semicircle of $180°$.
2. An inscribed angle intercepting it measures $180°/2 = 90°$.
3. The remaining angles sum to $90°$; here $7x = 90$.

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18. Answer: 42

1. The length ratio is the positive square root of the area ratio: $2:3$.
2. The large-to-small factor is $\frac{3}{2}$, so the larger side is $28 \times \frac{3}{2} = 42$.
3. Using $\frac{9}{4}$ as the length factor would confuse area and length scaling.

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19. Answer: 12,2

1. Add the horizontal movement to x and subtract the downward movement from y.
2. $x' = 5 + 7 = 12$; $y' = 7 - 5 = 2$.
3. The image is $(12, 2)$.

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20. Answer: translation; reflection; rotation

1. Translations, reflections and rotations are rigid motions.
2. A positive dilation with a scale factor different from 1 changes all lengths.
3. Select translation, reflection and rotation only.

21. Answer: 2,-5

1. Reflection across the x-axis sends (x, y) to $(x, -y)$.
2. Intermediate point: $(7, -5)$.
3. After moving 5 left, the final point is $(2, -5)$.

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22. Answer: -5,7

1. The $90°$ counterclockwise rule is $(x, y) \to (-y, x)$.
2. Substitute $(7, 5)$ to obtain $(-5, 7)$.
3. The distance from the origin is unchanged.

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23. Answer: The image is congruent to T.

1. Both moves are rigid transformations.
2. Their composition preserves all lengths and angles.
3. A rigid-motion mapping establishes congruence.

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24. Answer: It is similar but not congruent to its preimage.

1. A dilation preserves angles and scales lengths.
2. The factor 6 is not 1, so the non-degenerate triangle changes size.
3. A reflection preserves the scaled measurements, so the final image is similar but not congruent.

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25. Answer: 1764

1. Area scales by the square of the length factor.
2. $49 \times 6^2 = 1764$.
3. Multiplying only by the linear factor would undercount the area change.

26. Answer: The distance between the original segment endpoints.

1. The original endpoint separation is the desired copied length.
2. Keep that compass opening while marking a point on the new ray.
3. The resulting segment has the same endpoint distance.

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27. Answer: It passes through the midpoint.; It is perpendicular to AB.

1. Each arc intersection is equidistant from A and B.
2. The line through them is the perpendicular bisector.
3. It meets AB at its midpoint, 7 units from either endpoint, at a right angle.

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28. Answer: Intersect the internal angle bisectors.

1. A circle touching all three sides is an incircle.
2. Its center is equidistant from the sides.
3. Intersect internal angle bisectors to obtain the incenter; a perpendicular to a side supplies its radius.

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29. Answer: 1512

1. Volume scales with the cube of the length factor.
2. $7 \times 6^3 = 1512$.
3. A square factor would describe surface area instead.

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30. Answer: $(-5, 7)$

1. Reflection across $y = x$ exchanges the two coordinates.
2. $(7, -5)$ becomes $(-5, 7)$.
3. Reflecting a second time returns the original point.

31. Answer: 21

1. The sun angle and level ground give similar right triangles.
2. $\frac{h}{42} = \frac{7}{14} = \frac{1}{2}$.
3. $h = 21$ metres.

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32. Answer: 35

1. The coordinate differences are the legs of a right triangle.
2. Median length: $AM = \sqrt{(21)^2 + (28)^2} = 35$.
3. This is a length, not a slope or midpoint coordinate.

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33. Answer: 7,7

1. Average each coordinate independently.
2. $x = \frac{-7 + 21}{2} = 7$; $y = \frac{5 + 9}{2} = 7$.
3. The midpoint is $(7, 7)$.

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34. Answer: 12

1. Use the weighted average $P = \frac{3}{4}A + \frac{1}{4}B$.
2. $P = 5 + (\frac{1}{4})(28) = 12$.
3. The point is nearer A than B.

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35. Answer: 112

1. Horizontal and vertical differences give perpendicular side lengths.
2. Area: $14 \times 8 = 112$.
3. Report square units; adding side lengths would give a perimeter.

36. Answer: isosceles triangle

1. Identify the plane's stated orientation in the right circular cone.
2. That slice is a isosceles triangle.
3. The perspective sketch of a circular slice can look elliptical without changing its actual shape.

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37. Answer: cylinder

1. The rotating opposite side stays at constant distance from the axis.
2. Circular cross-sections stack along the rotation axis.
3. The result is a cylinder of radius 7 and height 10.

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38. Answer: 539

1. Subtract the opening from the enclosing rectangle.
2. Area: $(28)(21) - 7^2 = 539$.
3. Only the remaining covering area is requested, in square units.

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39. Answer: 330.75

1. Radius is half the diameter: $r = 7$.
2. Liquid height is $(\frac{3}{4}) \times 9$; volume is $\pi(7)^2 \times (\frac{3}{4}) \times 9$.
3. Enter coefficient 330.75; the actual liquid volume is 330.75π cubic units.

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40. Answer: 224

1. A closed cylinder has two bases plus its curved surface.
2. $SA = 2\pi(7)^2 + 2\pi(7)(9)$.
3. The coefficient of π is 224; use square units.

41. Answer: $(x-5)^2+(y+7)^2=64$

1. Use $(x-h)^2+(y-k)^2=r^2$.
2. The center's negative y-coordinate gives $(y+7)^2$.
3. The right side is $(8)^2=64$.

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42. Answer: 9

1. The right side in center–radius form is r^2.
2. $r=\sqrt{81}=9$.
3. The center is $(-7,5)$; the question asks for radius instead.

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43. Answer: 13.02

1. $\frac{\text{opposite}}{\text{hypotenuse}}=\sin\theta$ for the stated reference angle.
2. Opposite = 17 × sin(50°), in degree mode.
3. Rounded to the nearest hundredth: 13.02. It is shorter than the hypotenuse.

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44. Answer: $\frac{3}{5}$

1. Sine is opposite divided by hypotenuse.
2. $\frac{21}{35}=\frac{3}{5}$.
3. The adjacent/hypotenuse ratio $\frac{4}{5}$ would be cosine.

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45. Answer: 1176

1. Cone volume is $V=\frac{1}{3}\pi r^2h$.
2. The coefficient is $\frac{(21)^2\times 8}{3}$.
3. Answer: 1176. Do not replace perpendicular height with slant height.

46. Answer: 400

1. Population density is $\frac{\text{population}}{\text{area}}$.
2. $\frac{8400}{21} = 400$.
3. The population and area grow together, so the density remains 400 for these values.

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47. Answer: $\frac{7}{8}$

1. Opposite parallelogram sides are parallel.
2. Non-vertical parallel sides have equal slopes.
3. The opposite side therefore has slope $\frac{7}{8}$, not its negative reciprocal.

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48. Answer: 14

1. Add 49 and 25 to balance both completed squares.
2. $(x-7)^2 + (y+5)^2 = 122 + 49 + 25 = 196$.
3. The radius is $\sqrt{196} = 14$; its center is $(7, -5)$.