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, 16 items; Category 2, 16 items; Category 3, 16 items.

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1. Exponents and radicals · Category 1

Evaluate 343 raised to the power $\frac{2}{3}$.

Write the requested numeric value.

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2. Exponents and radicals · Category 1

For $x \neq 0$, simplify $(x^7 \times x^3) / x^2$. Which expression is equivalent?

A. 8x

B. x^8

C. x^{12}

D. x^{19}

Choose one response.

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3. Exponents and radicals · Category 1

Simplify $\sqrt{98} + \sqrt{392}$. Enter the coefficient of $\sqrt{2}$.

Write the requested numeric value.

4. Expressions · Category 1

A model $C = 70 + 7v$ gives cost in dollars for v visits. What does 70 represent?

A. The charge per visit

B. The number of visits

C. The total after every possible visit count

D. The one-time starting charge

Choose one response.

5. Expressions · Category 1

Rearrange $A = 7wh$ to isolate h, assuming $w \neq 0$.

A. $h = A\frac{w}{7}$

B. $h = A - 7w$

C. $h = \frac{A}{7w}$

D. $h = 7\frac{A}{w}$

Choose one response.

6. Functions · Category 1

A table has x-values 0, 1, 2 and y-values 7, 14, 28. Which function type could model the table?

A. Absolute value with vertex at $x = 0$

B. Linear

C. Exponential

D. Constant

Choose one response.

7. Functions · Category 1

A delivery cost is $f(x) = 7x + 5$. Find $f(4)$, in dollars.

Write the requested numeric value.

8. Functions · Category 1

The modeled height is $f(t) = t^2 + 5$. Find average rate of change from $t = 1$ to $t = 7$.

Write the requested numeric value.

9. Functions · Category 1

Compare $f(x) = 7x + 14$ with $g(x) = 7(2^x)$. Select all true statements.

A. f has a larger value at every nonnegative input

B. The two functions have the same initial value

C. f has the larger value at $x = 0$

D. g has the larger value at $x = 3$

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

10. Finance · Category 1

Account 5 earns interest on its original principal only, adding the same dollars each year. Which model describes its balance?

A. Exponential decay

B. Linear simple-interest growth

C. Exponential compound-interest growth

D. Quadratic growth

Choose one response.

11. Transformations · Category 1

If $f(x) = x^2$ and $g(x) = f(x - 7)$, how is the graph shifted?

A. Right 7 units

B. Left 7 units

C. Up 7 units

D. Down 7 units

Choose one response.

12. Statistics · Category 1

Sample 5 records paired shoe sizes and heights for students. Which display is appropriate for these bivariate numerical data?

A. One histogram of transport categories

B. Pie chart of a continuous pair

C. One box plot that merges both units

D. Scatter plot

Choose one response.

13. Statistics · Category 1

In sample 5, waiting times are strongly right-skewed with a very large outlier. Which summaries best resist that outlier?

A. Maximum and mean

B. Mode and total

C. Median and interquartile range

D. Mean and range

Choose one response.

14. Statistics · Category 1

A table for class 5 has 42 bus riders, 28 walkers and 21 early bus riders. How many bus riders are not early?

Write the requested numeric value.

15. Statistics · Category 1

A survey records 14 early cyclists, 21 late cyclists, 7 early drivers and 28 late drivers. Which group has the larger early-arrival proportion?

A. Cyclists

B. Drivers

C. Equal proportions

D. Cannot compare because the totals are equal

Choose one response.

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16. Functions · Category 1

For model 5, which rule is quadratic?

A. $y = 7x + 1$

B. $y = 7 \times 2^x$

C. $y = 7|x|$

D. $y = 7x^2 + 1$

Choose one response.

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17. Linear equations · Category 2

A club pays a $21 setup charge and $7 per participant. Its $84 recorded spending includes a $14 donation to another club in addition to the bill. How many participants were paid for?

Write the requested numeric value.

18. Slope and graphing · Category 2

A line has y-intercept 7 and passes through $(7, 21)$. Choose its equation.

A. $y = 2x - 7$

B. $y = 2x + 7$

C. $y = 7x + 2$

D. $y = -2x + 7$

Choose one response.

19. Slope and graphing · Category 2

Find the slope of a line perpendicular to $y = 7x + 5$.

A. $\frac{-1}{7}$

B. $\frac{1}{7}$

C. 7

D. -7

Choose one response.

20. Slope and graphing · Category 2

For $y = -2x + 14$, find its x-intercept as an ordered pair.

Enter coordinates x,y.

21. Slope and graphing · Category 2

A tank starts with 70 liters and loses 7 liters each minute until empty. What is the largest viable time in minutes?

Write the requested numeric value.

22. Inequalities · Category 2

A student's budget requires $-2x + 14 < 0$ after rearrangement. Which solution set is correct?

A. $x > -7$

B. $x > 7$

C. $x < 7$

D. $x \geq 7$

Choose one response.

23. Inequalities · Category 2

Tickets cost $7 for adults and $2 for children. A budget of at most $70 is available. Which inequality models it?

A. $7a + 2c \leq 70$

B. $7a + 2c \geq 70$

C. $7a + 2c < 70$

D. $2a + 7c \leq 70$

Choose one response.

24. Inequalities · Category 2

How should the solution to $y > x + 7$ be graphed?

A. Solid boundary; shade above

B. Dashed boundary; shade below

C. Solid boundary; shade below

D. Dashed boundary; shade above

Choose one response.

25. Systems · Category 2

Solve $x + y = 21$ and $x - y = 7$. Enter x,y.

Enter coordinates x,y.

26. Constraints · Category 2

For $x \geq 0$, $y \geq 0$, $x + y \leq 7$, which describes the feasible region?

A. The triangle with all three boundary sides excluded

B. The first-quadrant triangle including its three boundary sides

C. Only points above the diagonal in every quadrant

D. The entire first quadrant

Choose one response.

27. Constraints · Category 2

A shop makes whole items x,y with $x + y \leq 28$, $2x + y \leq 42$, $x \geq 0$, $y \geq 0$. Is $(14, 7)$ feasible?

A. Yes; both resource constraints and count restrictions hold

B. No; it exceeds the item limit

C. No; it exceeds the resource limit

D. No; negative counts are required

Choose one response.

28. Slope and graphing · Category 2

Compare $f(x) = 2x + 7$ with a linear table for g: $(0, 5)$, $(2, 11)$. Which has larger slope?

A. f

B. Equal slopes

C. Neither has a slope

D. g

Choose one response.

29. Linear models · Category 2

A fitted model predicts $y = 3x + 7$. Find predicted y at $x = 6$.

Write the requested numeric value.

30. Linear models · Category 2

Scatter plot 5 shows paired points close to a decreasing straight line, with small residuals of both signs. Which interpretation fits?

A. Proof that x causes y to decrease

B. Strong negative linear association

C. Weak positive linear association

D. No relationship of any kind

Choose one response.

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31. Linear models · Category 2

For fitted line $y = 2x + 7$, observations at $x = 1,2,3$ have y-values 10,10,14. Which residual sequence is correct?

A. $1, -1, 1$

B. $-1, 1, -1$

C. 3, 3, 7

D. 0, 0, 0

Choose one response.

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32. Systems · Category 2

For equation pair 5: $y = 2x + 7$ and $2y = 4x + 16$. How many solutions exist?

A. Exactly one solution

B. Infinitely many points on one shared line

C. Every ordered pair

D. No solutions

Choose one response.

33. Polynomials · Category 3

Expand $(x+7)(x+2)$. Which is correct?

A. x^2+14

B. $x^2+14x+9$

C. $x^2+9x+14$

D. x^2+7x+2

Choose one response.

34. Polynomials · Category 3

For $x \neq 0$, simplify $\frac{14x^3-21x^2}{7x}$.

A. $2x^2+3x$

B. $2x^2-3x$

C. $2x^3-3x^2$

D. $2x-3$

Choose one response.

35. Factoring · Category 3

Factor $x^2+10x+21$.

A. $(x+7)(x+3)$

B. $(x-7)(x-3)$

C. $(x+10)(x+1)$

D. $x(x+21)$

Choose one response.

36. Quadratic equations · Category 3

Solve $x^2 - 49 = 0$. Select all real solutions.

A. -7

B. 0

C. 49

D. 7

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

37. Quadratic graphs · Category 3

A rectangular garden has width x and length $x + 7$. Which function models its area?

A. $A(x) = x^2 + 7$

B. $A(x) = 7x$

C. $A(x) = x^2 + 7x$

D. $A(x) = 2x + 7$

Choose one response.

38. Quadratic graphs · Category 3

A quadratic has zeros 0 and 7, and passes through $(14, 98)$. Find its leading coefficient a in $y = ax(x - 7)$.

Write the requested numeric value.

39. Quadratic graphs · Category 3

Profit is $P(x) = -(x - 7)^2 + 49$. At which input x is its maximum attained?

Write the requested numeric value.

40. Quadratic graphs · Category 3

For $y = (x - 7)^2 - 5$, which statement about the graph is correct?

A. Vertex $(-7, -5)$; opens upward

B. Vertex $(7, 5)$; opens downward

C. A straight line with constant slope

D. Vertex $(7, -5)$; opens upward

Choose one response.

41. Quadratic graphs · Category 3

Height $h(t) = -t^2 + 14t$ models a launch from ground level. When does it return to ground after launch?

Write the requested numeric value.

42. Absolute value · Category 3

Solve $|x - 7| = 2$. Select both solutions.

A. -9

B. 9

C. 5

D. 7

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

43. Absolute value · Category 3

Find the vertex of $y = -2|x - 7|+5$. Enter x,y.

Enter coordinates x,y.

44. Exponentials · Category 3

A value follows $V(t) = 700(0.8)^t$. Which description is correct?

A. 80% decay per period

B. 20% growth per period

C. A fixed decrease of 0.8 units

D. 20% decay per period

Choose one response.

45. Exponentials · Category 3

A table has $t = 0,1,2$ and values 7,21,63. Which exponential model matches it?

A. $V(t) = 7 + 3t$

B. $V(t) = 7t^2$

C. $V(t) = 7 \times 3^t$

D. $V(t) = 3 \times 7^t$

Choose one response.

46. Exponentials · Category 3

For $f(x) = 7(0.5)^x$, select all true graph features.

A. The function increases for every real input

B. The y-intercept is positive

C. The horizontal asymptote is $y = 0$

D. The graph crosses the x-axis

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

47. Finance · Category 3

A $700 account earns 5% interest compounded annually for 2 years with no deposits. Find its final balance in dollars.

Write the requested numeric value.

48. Quadratic equations · Category 3

For $x^2 - 14x + 49 = 0$, how many distinct real roots are there?

Write the requested numeric value.

Practice 4: reasoning · solutions

1. Answer: 49

1. A denominator of 3 indicates a cube root.
2. The cube root of 343 is 7; square it.
3. The result is 49. The positive base makes the real rational power unambiguous.

2. Answer: x^{8}

1. Multiplication of equal bases adds exponents: $7 + 3$.
2. Division subtracts 2, leaving exponent 8.
3. The original nonzero restriction remains.

3. Answer: 21

1. The first root is $7\sqrt{2}$.
2. The second is $14\sqrt{2}$.
3. Add like radical coefficients: 21.

4. Answer: The one-time starting charge

1. The constant term is independent of the visit count.
2. At $v = 0$ the modeled cost equals the constant.
3. The coefficient of v, not the constant, is the charge per visit.

5. Answer: $h = \frac{A}{7w}$

1. Divide both sides by 7w.
2. The full product 7w is the denominator.
3. The nonzero assumption makes the division valid.

6. Answer: Exponential

1. Equal x-steps multiply y by 2.
2. The differences are not constant; the common ratio is 2.
3. The exponential model is $y = 7 \times 2^x$: each unit increase in x doubles the preceding output.

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7. Answer: 33

1. Substitute input 4 for x.
2. Calculate $7 \times 4 + 5$.
3. The output is 33 dollars; x is the delivery input, not the output.

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8. Answer: 8

1. $f(7) = 54$ and $f(1) = 6$.
2. Divide their output difference by 7-1.
3. $\frac{48}{6} = 8$ height units per time unit.

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9. Answer: f has the larger value at $x = 0$; g has the larger value at $x = 3$

1. At 0, $f = 14$, $g = 7$.
2. At 3, $f = 35$, $g = 56$.
3. The comparison changes with the input; neither is always larger.

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10. Answer: Linear simple-interest growth

1. The interest amount is fixed because it uses only the initial principal.
2. A fixed addition per year produces a linear balance.
3. Compound interest would multiply the changing balance instead.

11. Answer: Right 7 units

1. The new input equals zero at $x = 7$.
2. The parent vertex moves from $(0, 0)$ to $(7, 0)$.
3. A subtraction inside the input shifts the graph right.

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12. Answer: Scatter plot

1. There are two numerical measurements per student.
2. Keep the paired observations together.
3. A scatter plot displays numerical association; a single histogram cannot show the pairing.

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13. Answer: Median and interquartile range

1. The extreme value can substantially move the mean and standard deviation.
2. Median uses central ordering and IQR uses the middle half.
3. They provide a resistant center-and-spread pair.

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14. Answer: 21

1. The bus total includes early and not-early riders.
2. Subtract 21 from 42.
3. The remaining joint cell is 21; walkers belong to a different row.

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15. Answer: Cyclists

1. Cyclists: $\frac{14}{35} = 40\%$.
2. Drivers: $\frac{7}{35} = 20\%$.
3. Compare the conditional rates, not just the total number of early travelers.

16. Answer: $y = 7x^2 + 1$

1. A quadratic polynomial has highest variable exponent 2.
2. The variable is not in an exponent or absolute value.
3. Its nonzero leading coefficient gives a parabola.

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17. Answer: 7

1. Remove the donation from the final total: $84 - 14 = 70$.
2. Solve $21 + 7p = 70$.
3. $p = 7$; the donated amount is not part of the bill.

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18. Answer: $y = 2x + 7$

1. Slope is $\frac{21-7}{7-0} = 2$.
2. The intercept is 7.
3. Substitute the supplied point to verify both features.

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19. Answer: $\frac{-1}{7}$

1. Perpendicular nonvertical lines have negative reciprocal slopes.
2. The original slope is 7.
3. The negative reciprocal is $\frac{-1}{7}$, whose product with 7 is -1.

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20. Answer: 7,0

1. Set y to zero.
2. $0 = -2x + 14$, so $x = 7$.
3. The ordered pair is $(7, 0)$, not $(0, 7)$.

21. Answer: 10

1. Model $V(t) = 70 - 7t$ with $t \geq 0$.
2. Set $V = 0$: $t = \frac{70}{7} = 10$.
3. The viable time domain is $0 \leq t \leq 10$; the line beyond it predicts negative water.

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22. Answer: $x > 7$

1. Subtract 14 to get $-2x < -14$.
2. Divide $by -2$ and reverse the comparison.
3. The result is $x > 7$; the boundary is excluded.

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23. Answer: $7a + 2c \leq 70$

1. Multiply each ticket count by its price.
2. Add both costs and compare with the budget.
3. At most permits equality, so use ≤.

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24. Answer: Dashed boundary; shade above

1. The excluded boundary line is $y = x + 7$; equality is not permitted by >.
2. Strict > excludes the boundary, so it is dashed.
3. Larger y-values lie above the boundary.

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25. Answer: 14,7

1. Add the equations: $2x = 28$.
2. Then $x = 14$ and $y = 7$.
3. Check both original equations: $14 + 7 = 21$, and $14 - 7 = 7$. Both hold.

26. Answer: The first-quadrant triangle including its three boundary sides

1. The axes restrict the region to nonnegative coordinates.
2. The line $x + y = 7$ connects $(7, 0)$ and $(0, 7)$.
3. The ≤ sign includes the line and the side toward the origin.

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27. Answer: Yes; both resource constraints and count restrictions hold

1. Total items: $14 + 7 = 21 \leq 28$.
2. Resource use: $2(14) + 7 = 35 \leq 42$.
3. Both counts are nonnegative integers.

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28. Answer: g

1. The slope of f is 2.
2. The table rate is $\frac{6}{2} = 3$.
3. Thus g has the larger rate, regardless of the different intercepts.

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29. Answer: 25

1. Substitute $x = 6$ into the line.
2. Calculate $7(2) + 7 = 21$; the predicted output is 21.
3. This is a model prediction, not a guaranteed individual outcome.

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30. Answer: Strong negative linear association

1. The pattern decreases as x grows, so direction is negative.
2. Small residuals around a line indicate a close linear fit.
3. This establishes association, not causation.

31. Answer: 1, -1, 1

1. The predicted values at the three supplied inputs are 9, 11 and 13. Compare each observation with its matching prediction.
2. Residual is observed minus predicted.
3. The residuals are 1, -1 and 1, straddling zero.

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32. Answer: No solutions

1. Divide the second equation by 2.
2. It becomes $y = 2x + 8$, while the first line is $y = 2x + 7$. Equal slopes and unequal intercepts make them parallel.
3. Distinct parallel lines never intersect.

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33. Answer: $x^2 + 9x + 14$

1. Multiply all four term pairs.
2. The middle coefficient is $7 + 2 = 9$.
3. The constant product is 14, so the full expansion is $x^2 + 9x + 14$.

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34. Answer: $2x^2 - 3x$

1. Divide every numerator term by the monomial denominator.
2. The coefficient quotients are 2 and -3, and powers decrease by 1.
3. The simplified result retains $x \neq 0$ from the original denominator.

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35. Answer: $(x + 7)(x + 3)$

1. The factor constants need product 21 and sum 10.
2. 7 and 3 satisfy both conditions.
3. The factorization is $(x + 7)^2$; expanding gives $x^2 + 14x + 49$, matching every coefficient.

36. Answer: 7; -7

1. Rewrite $x^2 = 49$.
2. Both positive and negative square roots are solutions.
3. The solutions are 7 and -7; zero does not satisfy the equation.

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37. Answer: $A(x) = x^2 + 7x$

1. Area equals length times width.
2. $A(x) = x(x + 7) = x^2 + 7x$. Area multiplies both positive dimensions rather than adding them.
3. The practical domain requires positive dimensions.

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38. Answer: 1

1. Substitute the point: $98 = a(14)(7)$.
2. The product of the known factors is 98.
3. Divide by that nonzero product to obtain $a = 1$.

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39. Answer: 7

1. A negative square term makes the parabola open downward.
2. The vertex is $(7, 49)$.
3. The maximum occurs at input 7; the maximum output is a different quantity.

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40. Answer: Vertex $(7, -5)$; opens upward

1. Vertex form identifies h and k directly.
2. The leading coefficient is positive.
3. Thus the vertex is $(7, -5)$ and range is $y \geq -5$.

41. Answer: 14

1. Set $h = 0$: $t(-1t + 14) = 0$.
2. The roots are 0 and 14.
3. Time 0 is launch; the later viable time is 14.

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42. Answer: 9; 5

1. Set $x - 7 = 2$ or $x - 7 = -2$.
2. The resulting inputs are 9 and 5.
3. Check: 9 and 5 are each 2 units from 7, so both satisfy the original absolute-value equation.

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43. Answer: 7,5

1. The inside is zero at $x = 7$.
2. The outside shift gives $y = 5$.
3. The negative multiplier opens the V downward without changing the vertex.

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44. Answer: 20% decay per period

1. The factor 0.8 retains 80% each period.
2. The lost fraction is $1 - 0.8 = 0.2$.
3. This is 20% decay, not an 80% loss or a fixed-dollar decrease.

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45. Answer: $V(t) = 7 \times 3^t$

1. Initial value at 0 is 7.
2. Each one-unit step multiplies by 3.
3. The model is $f(t) = 7(3^t)$. Check $t = 0$,1,2 to recover 7, 21 and 63.

46. Answer: The y-intercept is positive; The horizontal asymptote is $y = 0$

1. $f(0) = 7 > 0$.
2. The function decreases but remains positive at every finite real input.
3. Its horizontal asymptote is $y = 0$; it never crosses the x-axis.

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47. Answer: 771.75

1. Use $A = P(1 + r)^t$ with $P = 700$, $r = 0.05$ and $t = 2$.
2. $A = 700 \times 1.05^2 = 771.75$.
3. This is final balance; subtract the principal to obtain interest earned.

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48. Answer: 1

1. The discriminant is $196 - 4(49) = 0$.
2. The expression factors as $(x - 7)^2$.
3. There is one distinct root with multiplicity two.