Answer Key — Practice Test 1

#	Ans	Category	#	Ans	Category	#	Ans	Category
1	C	Integrating Essential Skills	16	J	Algebra	31	B	Geometry
2	H	Geometry	17	B	Integrating Essential Skills	32	H	Number & Quantity
3	A	Statistics & Probability	18	F	Algebra	33	C	Geometry
4	F	Functions	19	C	Statistics & Probability	34	J	Functions
5	B	Integrating Essential Skills	20	H	Integrating Essential Skills	35	C	Number & Quantity
6	G	Integrating Essential Skills	21	A	Functions	36	J	Geometry
7	C	Functions	22	G	Geometry	37	D	Statistics & Probability
8	F	Algebra	23	B	Integrating Essential Skills	38	G	Statistics & Probability
9	D	Integrating Essential Skills	24	F	Algebra	39	B	Functions
10	H	Geometry	25	D	Number & Quantity	40	F	Number & Quantity
11	C	Integrating Essential Skills	26	J	Algebra	41	C	Integrating Essential Skills
12	G	Algebra	27	C	Functions	42	F	Functions
13	D	Functions	28	F	Geometry	43	B	Statistics & Probability
14	F	Geometry	29	B	Algebra	44	F	Algebra
15	C	Number & Quantity	30	J	Statistics & Probability	45	B	Geometry

Your results by category

Category	Questions	Share of test	Your number correct
Preparing for Higher Math	**36**	**80%**	**/ 36**
Number & Quantity Questions 15, 25, 32, 35, 40	5	11%	/ 5
Algebra Questions 8, 12, 16, 18, 24, 26, 29, 44	8	18%	/ 8
Functions Questions 4, 7, 13, 21, 27, 34, 39, 42	8	18%	/ 8
Geometry Questions 2, 10, 14, 22, 28, 31, 33, 36, 45	9	20%	/ 9
Statistics & Probability Questions 3, 19, 30, 37, 38, 43	6	13%	/ 6
Integrating Essential Skills Questions 1, 5, 6, 9, 11, 17, 20, 23, 41	**9**	**20%**	**/ 9**
Total	**45**	**100%**	**/ 45**

Answer Explanations — Practice Test 1

1. C Integrating Essential Skills · Easy

Total earnings: $2(35) + 3(80) = 70 + 240 = 310$. Average: $310 \div 5 = 62$. ($57.50 is the average of 35 and 80, which ignores how many days each amount was earned.)

2. H Geometry · Easy

An exterior angle of a triangle equals the sum of the two remote interior angles: $42^\circ + 87^\circ = 129^\circ$. (Equivalently, $\angle ACB = 180^\circ - 129^\circ = 51^\circ$, and $\angle ACD = 180^\circ - 51^\circ = 129^\circ$.)

3. A Statistics & Probability · Easy

Mean $= (12 + 15 + 15 + 18 + 21 + 27)/6 = 108/6 = 18$. Median $= (15 + 18)/2 = 16.5$. Mode $= 15$. Range $= 27 - 12 = 15$. The mean is greatest.

4. F Functions · Easy

Substitute 3: $3^2 + 2 = 11$ ✓. The others give $2^3 + 4 = 12$, $5(3) - 3 = 12$, and $27 - 17 = 10$.

5. B Integrating Essential Skills · Medium

The tax applies only to the cartridges: $1.06(18x) = 19.08x$. Then add the untaxed $7 shipping fee: $y = 19.08x + 7$. The choice $1.06(18x + 7)$ incorrectly taxes the shipping.

6. G Integrating Essential Skills · Medium

Time = distance ÷ rate. Out: $2.4/18 = 0.1\overline{3}$ hr $= 8$ min. Back: $2.4/24 = 0.1$ hr $= 6$ min. Total: $8 + 6 = 14$ minutes.

7. C Functions · Medium

After day n, the total is $9 + 6(n - 1)$. Solve $9 + 6(n - 1) > 250$: $6(n - 1) > 241$, so $n - 1 > 40.1\overline{6}$ and $n > 41.1\overline{6}$. The first whole number is $n = 42$. Check: day 41 gives $9 + 240 = 249$ (not over 250); day 42 gives 255.

8. F Algebra · Medium

Numerator: $(2x^3y^{-2})^3 = 8x^9y^{-6}$. Divide: $\frac{8}{4} = 2$, $x^{9-(-1)} = x^{10}$, $y^{-6-2} = y^{-8}$. Result: $2x^{10}y^{-8} = \frac{2x^{10}}{y^8}$. (The coefficient 2 is cubed too, giving 8, not 6.)

9. D Integrating Essential Skills · Medium

Distance: $214 - 187 = 27$ miles. Time: 18 minutes $= 0.3$ hour. Speed: $27 \div 0.3 = 90$ miles per hour.

10. H Geometry · Medium

Moving from P to M changes x by $+7$ and y by -7. Make the same move from M: $(4 + 7,\ -1 - 7) = (11, -8)$. Check: $\left(\frac{-3+11}{2}, \frac{6+(-8)}{2}\right) = (4, -1)$.

11. C Integrating Essential Skills · Medium

Expenses: $180 + 435 + 95 = 710$. Needed revenue: $710 + 500 = 1{,}210$. Per student: $1{,}210 \div 400 = 3.025$. The price must be at least $3.025 and a multiple of $0.25, so the lowest price is $3.25. ($3.00 would raise only $490.)

12. G Algebra · Medium

Let n and p be the prices. $4n + 3p = 19.25$ and $6n + 2p = 21.50$. Multiply the first by 3 and the second by 2: $12n + 9p = 57.75$ and $12n + 4p = 43.00$. Subtract: $5p = 14.75$, so $p = 2.95$. Then $4n = 19.25 - 8.85 = 10.40$, so $n = 2.60$. Total: $2.60 + 2.95 = 5.55$.

13. D Functions · Medium

First, $f(1) = 2(1) - 5 = -3$. Then $g(-3) = (-3)^2 - 3(-3) = 9 + 9 = 18$. ($-9$ is $f\big(g(1)\big)$, which reverses the order.)

14. F Geometry · Medium

The circle's area is $\pi(6^2) = 36\pi$. The square's diagonal is a diameter, 12 cm, so its area is $\frac{12^2}{2} = 72$ (or its side is $6\sqrt{2}$, and $(6\sqrt{2})^2 = 72$). Shaded area: $36\pi - 72$.

15. C Number & Quantity · Medium

FOIL: $3 + 12i - 2i - 8i^2 = 3 + 10i - 8(-1) = 11 + 10i$.

16. J Algebra · Medium

$(y + 4)^2 = y^2 + 8y + 16$. Multiply by $(y + 4)$: $y^3 + 8y^2 + 16y + 4y^2 + 32y + 64 = y^3 + 12y^2 + 48y + 64$.

17. B Integrating Essential Skills · Medium

Sum of 6 scores: $6(82) = 492$. Sum of the other 5: $5(86) = 430$. Lowest score: $492 - 430 = 62$.

18. F Algebra · Medium

$|2x - 3| < 7$ means $-7 < 2x - 3 < 7$. Add 3: $-4 < 2x < 10$. Divide by 2: $-2 < x < 5$. ("$x < -2$ or $x > 5$" is the solution to $|2x - 3| > 7$.)

19. C Statistics & Probability · Medium

Students who do at least one: $60 - 9 = 51$. Both: $34 + 25 - 51 = 8$. The selection is only among the 25 sport players, so the probability is $\frac{8}{25}$.

20. H Integrating Essential Skills · Medium

The tank has $0.25(30) = 7.5$ L of acid. Adding x L of pure acid: $\frac{7.5 + x}{30 + x} = 0.40$. Then $7.5 + x = 12 + 0.4x$, so $0.6x = 4.5$ and $x = 7.5$.

21. A Functions · Medium

Left 3: $(4, -5) \to (1, -5)$. Vertical stretch by 2: $(1, -10)$. Reflect over the x-axis: $(1, 10)$. (Shifting left subtracts from x.)

22. G Geometry · Medium

Areas of similar figures scale by the square of the scale factor: $k^2 = 4$, so $k = 2$. The perimeter of $\triangle ABC$ is 36, so the perimeter of $\triangle DEF$ is $2(36) = 72$. (144 multiplies the perimeter by 4.)

23. B Integrating Essential Skills · Medium

Points × credits: $4(4) + 3(3) + 3(3) + 2(2) + 4(1) = 16 + 9 + 9 + 4 + 4 = 42$. Total credits: $4 + 3 + 3 + 2 + 1 = 13$. GPA: $42/13 \approx 3.23$. (3.20 is the unweighted average of the five grades.)

24. F Algebra · Medium

$\log_x 54 - \log_x 2 = \log_x \frac{54}{2} = \log_x 27 = 3$. So $x^3 = 27$ and $x = 3$.

25. D Number & Quantity · Medium

The ones digits of powers of 7 repeat in a cycle of 4: 7, 9, 3, 1. Since $2026 = 4(506) + 2$, 7^{2026} has the same ones digit as $7^2 = 49$, which is 9.

26. J Algebra · Medium

$|x - y|$ is largest when x and y are as far apart as possible. Either $x - y$ is as large as possible ($2 - (-1) = 3$) or as small as possible ($-3 - 6 = -9$, so $|x - y| = 9$). The maximum is 9.

27. C Functions · Medium

$\frac{f(3)}{f(1)} = b^2 = 9$, so $b = 3$, and $a = 6/3 = 2$. $f(5) = 2 \cdot 3^5 = 2(243) = 486$.

28. F Geometry · Medium

Complete the square: $(x^2 - 6x + 9) + (y^2 + 10y + 25) = -9 + 9 + 25$, so $(x - 3)^2 + (y + 5)^2 = 25$. The center is $(3, -5)$ and the radius is $\sqrt{25} = 5$.

29. B Algebra · Medium

A quadratic has exactly one real solution when its discriminant is 0: $(-k)^2 - 4(4)(9) = 0$, so $k^2 = 144$ and $k = 12$. (Then $4x^2 - 12x + 9 = (2x - 3)^2$.)

30. J Statistics & Probability · Hard

P(rain and canceled) $= 0.40(0.75) = 0.30$. P(no rain and canceled) $= 0.60(0.15) = 0.09$. P(canceled) $= 0.39$. Given that it was canceled: $0.30/0.39 \approx 0.769$, or about 77%. (39% is the overall chance of cancellation, not the conditional probability.)

31. B Geometry · Hard

Let $AC = h$. In $\triangle ACD$ (45°), $DC = h$. In $\triangle ACB$ (30° at B), $BC = h\sqrt{3}$. So $BD = h\sqrt{3} - h = 40$, giving $h = \dfrac{40}{\sqrt{3} - 1} = \dfrac{40(\sqrt{3} + 1)}{2} = 20(\sqrt{3} + 1) \approx 54.6$.

32. H Number & Quantity · Hard

In each case, the remainder is 1 less than the divisor, so $n + 1$ is divisible by 3, 4, and 5. The least common multiple is 60, so $n + 1 = 60$ and $n = 59$. Check: $59 = 3(19) + 2 = 4(14) + 3 = 5(11) + 4$.

33. C Geometry · Hard

The slant height is the hypotenuse of a right triangle with legs 12 (height) and 9 (half the base side): $\sqrt{144 + 81} = 15$. Each triangular face: $\frac{1}{2}(18)(15) = 135$; four faces: 540. Base: $18^2 = 324$. Total: $540 + 324 = 864$. (756 uses the height 12 instead of the slant height.)

34. J Functions · Hard

f is undefined when $\tan x = 1$ (the denominator is 0) or when $\tan x$ is undefined. $\tan 225° = \tan 45° = 1$, so $225°$ is not in the domain. ($\tan 135° = -1$, which is fine.)

35. C Number & Quantity · Hard

$(x - 2)(x - 3)$ is a product of two consecutive integers. For the product to be prime, one factor must be ± 1 and the other $\pm$ a prime with the same sign. $x = 4$ gives $(2)(1) = 2$, and $x = 1$ gives $(-1)(-2) = 2$. Every other integer gives 0 or a composite number (e.g., $x = 5$ gives 6). So there are 2 integers.

36. J Geometry · Hard

The angle inside the triangle at the turning point is $180° - 30° = 150°$. By the law of cosines, $d^2 = 300^2 + 500^2 - 2(300)(500)\cos 150°$. Using $30°$ is a common mistake: that is the angle of the turn, not the angle inside the triangle.

37. D Statistics & Probability · Hard

Seat Lena anywhere. Omar is equally likely to be in any of the other 7 seats, and 2 of them are next to Lena. The probability is $\frac{2}{7}$.

38. G Statistics & Probability · Hard

Median: with 32 scores, average the 16th and 17th. Cumulative counts: 2, 6, 13, 22, so both are 8 and the median is 8. Mean: $\frac{5(2)+6(4)+7(7)+8(9)+9(6)+10(4)}{32} = \frac{249}{32} \approx 7.78$. Difference: $8 - 7.78 \approx 0.2$.

39. B Functions · Hard

Factor: $f(x) = \dfrac{2(x - 2)(x + 2)}{(x - 3)(x + 2)}$. The factor $(x + 2)$ cancels, so $x = -2$ is a hole, not an asymptote. The only vertical asymptote is $x = 3$.

40. F Number & Quantity · Hard

$15a = 6b$ simplifies to $5a = 2b$, so a is a multiple of 2 and b is a multiple of 5. Write $a = 2t$ and $b = 5t$. Since $\gcd(a, b) = 1$, $t = 1$. So $a = 2$, $b = 5$, and $a + b = 7$.

41. C Integrating Essential Skills · Hard

Volume of the ball: $\frac{4}{3}\pi(27) = 36\pi$. Each foot of depth in the tank holds $\pi(3^2) = 9\pi$. The water rises $36\pi / 9\pi = 4$ feet, so the new depth is $4 + 4 = 8$ feet. (The ball's diameter is 6 ft, which is less than 8 ft, so it is fully underwater.)

42. F Functions · Hard

Amplitude $a = \frac{5-(-1)}{2} = 3$. Midline $c = \frac{5+(-1)}{2} = 2$. Period $\frac{2\pi}{b} = \pi$, so $b = 2$. The function is $y = 3\cos(2x) + 2$.

43. B Statistics & Probability · Hard

Count by cases. 2 seniors and 2 juniors: $\binom{5}{2}\binom{7}{2} = 10(21) = 210$. 3 seniors and 1 junior: $\binom{5}{3}\binom{7}{1} = 10(7) = 70$. 4 seniors: $\binom{5}{4} = 5$. Total: $210 + 70 + 5 = 285$.

44. F Algebra · Hard

Use the common denominator $(x + y)(x - y) = x^2 - y^2$: $\frac{x(x-y) + y(x+y)}{x^2 - y^2} = \frac{x^2 - xy + xy + y^2}{x^2 - y^2} = \frac{x^2 + y^2}{x^2 - y^2}$.

45. B Geometry · Hard

Enclose the triangle in the rectangle from $x = 1$ to 7 and $y = 2$ to 10 (area $6 \times 8 = 48$). Subtract the three right triangles outside $\triangle ABC$: $\frac{1}{2}(6)(2) = 6$, $\frac{1}{2}(2)(6) = 6$, and $\frac{1}{2}(4)(8) = 16$. Area $= 48 - 28 = 20$. (Shoelace: $\frac{1}{2}|1(4 - 10) + 7(10 - 2) + 5(2 - 4)| = \frac{1}{2}(40) = 20$.)