

AMC 8-style original practice test - Edition 1

Student paper

Name: _____ Date: _____

Choose exactly one of the five answers for each question. Work without a calculator.

This is one fixed original paper. For timed practice, allow 40 minutes; otherwise work at your own pace.

Use the separate hint sheet only after making an attempt. Answers and complete solutions are in the teacher edition.

Optional practice time: 40 minutes.

1. A museum charges \$7 for each adult ticket and \$4 for each child ticket. What is the cost of 2 adult tickets and 3 child tickets?

A. \$22 B. \$24 C. \$25 D. \$26 E. \$29

2. A \$50 backpack is discounted by 20%. A sales tax of 10% is then applied to the discounted price. What is the final price?

A. \$35 B. \$40 C. \$44 D. \$45 E. \$55

3. The three angles of a triangle are in the ratio 2:3:4. What is the smallest angle?

A. 20 degrees B. 30 degrees C. 40 degrees D. 45 degrees E. 60 degrees

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Optional practice time: 40 minutes.

4. A two-digit number is formed using two different digits from 3, 5, and 7. How many such numbers are divisible by 5?

A. 1 B. 2 C. 3 D. 4 E. 6

5. A rectangle has perimeter 30 cm. Its length is twice its width. What is its area?

A. 25 square cm B. 40 square cm C. 45 square cm D. 50 square cm E. 100 square cm

6. Five numbers have mean 12. One of the numbers, 8, is removed. What is the mean of the remaining four numbers?

A. 10 B. 11 C. 12 D. 13 E. 14

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Optional practice time: 40 minutes.

7. How many integers from 1 through 60, inclusive, are divisible by 4 or by 6?

A. 15 B. 18 C. 20 D. 25 E. 30

8. A fair six-sided die is rolled twice. What is the probability that the sum of the two results is odd?

A. $\frac{1}{6}$ B. $\frac{1}{3}$ C. $\frac{1}{2}$ D. $\frac{2}{3}$ E. $\frac{5}{6}$

9. A sequence starts at 3. To obtain the next terms, add 2, then 4, then 6, and continue adding consecutive positive even numbers. What is the eighth term?

A. 45 B. 51 C. 57 D. 59 E. 75

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10. On a square grid, a robot travels from (0, 0) to (3, 2), using only steps one unit right or one unit up. How many routes avoid the point (1, 1)?

A. 3 B. 4 C. 5 D. 6 E. 10

11. A team plays 12 games. It earns 3 points for a win, 1 point for a tie, and 0 points for a loss. It has 4 ties and 22 points. How many losses does it have?

A. 0 B. 1 C. 2 D. 4 E. 6

12. A rectangular floor is 84 cm by 60 cm. It is covered with identical square tiles of the largest possible whole-number side length, with no gaps or cutting. How many tiles are needed?

A. 12 B. 24 C. 30 D. 35 E. 42

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13. A tank is one-third full. Adding 12 liters makes it five-sixths full. What is the tank's capacity?

A. 18 liters B. 20 liters C. 24 liters D. 30 liters E. 36 liters

14. All six faces of a cube are painted. The cube is then cut into 27 equal small cubes in a 3 by 3 by 3 arrangement. How many small cubes have exactly two painted faces?

A. 6 B. 8 C. 12 D. 18 E. 20

15. How many ordered pairs of positive integers (x, y) satisfy $x + 2y = 15$?

A. 5 B. 6 C. 7 D. 8 E. 14

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16. Triangle ABC has area 72 square units. M is the midpoint of AB. N lies on AC with $AN:NC = 1:2$. What is the area of triangle AMN?

A. 8 B. 12 C. 18 D. 24 E. 36

17. How many integers from 1 through 100 leave remainder 2 when divided by 5 and remainder 3 when divided by 7?

A. 1 B. 2 C. 3 D. 4 E. 5

18. A bag contains 3 red counters and 2 blue counters. Two counters are chosen uniformly without replacement. What is the probability that they have the same color?

A. $1/5$ B. $3/10$ C. $2/5$ D. $1/2$ E. $3/5$

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Optional practice time: 40 minutes.

19. A three-digit palindrome has hundreds digit 2 and is divisible by 9. What is the number?

A. 222 B. 232 C. 242 D. 252 E. 272

20. Six chairs are in a row. In how many ways can two of the chairs be selected so that they are not adjacent? The two selected chairs are not assigned to particular people.

A. 8 B. 9 C. 10 D. 12 E. 15

21. At 3:20 on a clock whose hands move continuously, what is the smaller angle between the hour hand and the minute hand?

A. 10 degrees B. 20 degrees C. 25 degrees D. 30 degrees E. 40 degrees

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Optional practice time: 40 minutes.

22. A 4 by 4 board consists of 16 unit squares. How many squares of all sizes have sides along the grid lines?

A. 16 B. 20 C. 25 D. 30 E. 40

23. Use the digits 1, 2, 3, and 4 exactly once to form two two-digit numbers. What is the smallest possible positive difference between the two numbers?

A. 3 B. 5 C. 7 D. 9 E. 11

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Optional practice time: 40 minutes.

24. Positive integers a and b satisfy $a + b = 12$. Their product is not divisible by 3. What is the greatest possible product?

A. 27 B. 30 C. 32 D. 35 E. 36

25. Two players alternate removing 1, 2, or 3 stones from a pile of 30 stones. The player who removes the last stone wins. Which first move guarantees the first player a win if they continue to play correctly?

A. Remove 1 stone B. Remove 2 stones C. Remove 3 stones D. Any legal first move E. No first move guarantees a win

AMC 8-style original practice test - Edition 1

Worked solutions

Use after attempting the student paper. Alternative valid methods are welcome.

1. A museum charges \$7 for each adult ticket and \$4 for each child ticket. What is the cost of 2 adult tickets and 3 child tickets?

A. \$22 B. \$24 C. \$25 D. \$26 E. \$29

Answer: D. \$26

The adult tickets cost $2 \times \$7 = \$14$, and the child tickets cost $3 \times \$4 = \$12$. The total is $\$14 + \$12 = \$26$.

2. A \$50 backpack is discounted by 20%. A sales tax of 10% is then applied to the discounted price. What is the final price?

A. \$35 B. \$40 C. \$44 D. \$45 E. \$55

Answer: C. \$44

The discounted price is $0.80 \times \$50 = \$40$. The tax is $0.10 \times \$40 = \$4$, so the final price is \$44.

3. The three angles of a triangle are in the ratio 2:3:4. What is the smallest angle?

A. 20 degrees B. 30 degrees C. 40 degrees D. 45 degrees E. 60 degrees

Answer: C. 40 degrees

Each part is $180/9 = 20$ degrees. The smallest angle has 2 parts, so it measures 40 degrees.

4. A two-digit number is formed using two different digits from 3, 5, and 7. How many such numbers are divisible by 5?

A. 1 B. 2 C. 3 D. 4 E. 6

Answer: B. 2

The units digit must be 5, since 0 is unavailable. The tens digit can be 3 or 7. The numbers are 35 and 75, giving 2 numbers.

5. A rectangle has perimeter 30 cm. Its length is twice its width. What is its area?

A. 25 square cm B. 40 square cm C. 45 square cm D. 50 square cm E. 100 square cm

Answer: D. 50 square cm

The length plus the width is $30/2 = 15$ cm. Thus $3w = 15$ and $w = 5$ cm. The length is 10 cm, giving area $10 \times 5 = 50$ square cm.

6. Five numbers have mean 12. One of the numbers, 8, is removed. What is the mean of the remaining four numbers?

A. 10 B. 11 C. 12 D. 13 E. 14

Answer: D. 13

The original sum is $5 \times 12 = 60$. The remaining sum is $60 - 8 = 52$, so the new mean is $52/4 = 13$.

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Worked solutions

Use after attempting the student paper. Alternative valid methods are welcome.

7. How many integers from 1 through 60, inclusive, are divisible by 4 or by 6?

A. 15 B. 18 C. 20 D. 25 E. 30

Answer: C. 20

There are 15 multiples of 4 and 10 multiples of 6. The 5 multiples of 12 were counted twice. Therefore the required count is $15 + 10 - 5 = 20$.

8. A fair six-sided die is rolled twice. What is the probability that the sum of the two results is odd?

A. $1/6$ B. $1/3$ C. $1/2$ D. $2/3$ E. $5/6$

Answer: C. $1/2$

Of the 36 equally likely ordered results, $3 \times 3 = 9$ are odd then even, and another 9 are even then odd. The probability is $18/36 = 1/2$.

9. A sequence starts at 3. To obtain the next terms, add 2, then 4, then 6, and continue adding consecutive positive even numbers. What is the eighth term?

A. 45 B. 51 C. 57 D. 59 E. 75

Answer: D. 59

The seventh addition is 14. The seven added numbers sum to $7 \times (2 + 14)/2 = 56$. Thus the eighth term is $3 + 56 = 59$.

10. On a square grid, a robot travels from (0, 0) to (3, 2), using only steps one unit right or one unit up. How many routes avoid the point (1, 1)?

A. 3 B. 4 C. 5 D. 6 E. 10

Answer: B. 4

Every route consists of 3 right steps and 2 up steps, so there are 10 ways to choose the positions of the up steps. A route through (1, 1) has 2 choices before that point and 3 after it, giving 6 routes. Therefore $10 - 6 = 4$ routes avoid the point.

11. A team plays 12 games. It earns 3 points for a win, 1 point for a tie, and 0 points for a loss. It has 4 ties and 22 points. How many losses does it have?

A. 0 B. 1 C. 2 D. 4 E. 6

Answer: C. 2

The team has $18/3 = 6$ wins. Its 12 games consist of 6 wins, 4 ties, and $12 - 6 - 4 = 2$ losses.

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Worked solutions

Use after attempting the student paper. Alternative valid methods are welcome.

12. A rectangular floor is 84 cm by 60 cm. It is covered with identical square tiles of the largest possible whole-number side length, with no gaps or cutting. How many tiles are needed?

A. 12 B. 24 C. 30 D. 35 E. 42

Answer: D. 35

The largest possible tile side is $\gcd(84, 60) = 12$ cm. There are $84/12 = 7$ tiles along one side and $60/12 = 5$ along the other, so $7 \times 5 = 35$ tiles are needed.

13. A tank is one-third full. Adding 12 liters makes it five-sixths full. What is the tank's capacity?

A. 18 liters B. 20 liters C. 24 liters D. 30 liters E. 36 liters

Answer: C. 24 liters

The added 12 liters fill $1/2$ of the tank. The full capacity is therefore 12 divided by $1/2$, or 24 liters.

14. All six faces of a cube are painted. The cube is then cut into 27 equal small cubes in a 3 by 3 by 3 arrangement. How many small cubes have exactly two painted faces?

A. 6 B. 8 C. 12 D. 18 E. 20

Answer: C. 12

A corner small cube has three painted faces. On each edge, the one small cube between the corners has exactly two painted faces. The 12 edges give 12 such cubes; face-interior and interior cubes have fewer painted faces.

15. How many ordered pairs of positive integers (x, y) satisfy $x + 2y = 15$?

A. 5 B. 6 C. 7 D. 8 E. 14

Answer: C. 7

We have $x = 15 - 2y$. Positivity gives $1 \leq y \leq 7$. Each of these seven integer values gives exactly one positive x , so there are 7 ordered pairs.

16. Triangle ABC has area 72 square units. M is the midpoint of AB. N lies on AC with $AN:NC = 1:2$. What is the area of triangle AMN?

A. 8 B. 12 C. 18 D. 24 E. 36

Answer: B. 12

Triangle AMC has half the area of ABC because $AM = AB/2$ and the two triangles share the altitude from C. Its area is 36. Since $AN = AC/3$, triangle AMN has one-third of the area of AMC, or 12 square units.

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Worked solutions

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17. How many integers from 1 through 100 leave remainder 2 when divided by 5 and remainder 3 when divided by 7?

A. 1 B. 2 C. 3 D. 4 E. 5

Answer: C. 3

Among 3, 10, 17, 24, and 31, only 17 has remainder 2 on division by 5. Both remainders repeat every 35, giving 17, 52, and 87 in the required range. The next is 122, so there are 3.

18. A bag contains 3 red counters and 2 blue counters. Two counters are chosen uniformly without replacement. What is the probability that they have the same color?

A. $1/5$ B. $3/10$ C. $2/5$ D. $1/2$ E. $3/5$

Answer: C. $2/5$

There are $5 \times 4 / 2 = 10$ equally likely unordered pairs. Of these, $3 \times 2 / 2 = 3$ are red-red, and 1 is blue-blue. Thus the probability is $4/10 = 2/5$.

19. A three-digit palindrome has hundreds digit 2 and is divisible by 9. What is the number?

A. 222 B. 232 C. 242 D. 252 E. 272

Answer: D. 252

The number has the form $2b2$, whose digit sum is $b + 4$. For $0 \leq b \leq 9$, this sum lies from 4 through 13, so the only possible multiple of 9 is 9. Therefore $b = 5$ and the number is 252.

20. Six chairs are in a row. In how many ways can two of the chairs be selected so that they are not adjacent? The two selected chairs are not assigned to particular people.

A. 8 B. 9 C. 10 D. 12 E. 15

Answer: C. 10

There are $6 \times 5 / 2 = 15$ unordered selections of two chairs. Exactly 5 selections use adjacent chairs, namely consecutive positions 1-2 through 5-6. Hence $15 - 5 = 10$ selections are allowed.

21. At 3:20 on a clock whose hands move continuously, what is the smaller angle between the hour hand and the minute hand?

A. 10 degrees B. 20 degrees C. 25 degrees D. 30 degrees E. 40 degrees

Answer: B. 20 degrees

At 3:00 the hour hand is 90 degrees clockwise from 12. In 20 minutes it moves 10 degrees, reaching 100 degrees. The minute hand is at $20 \times 6 = 120$ degrees. Their smaller separation is $120 - 100 = 20$ degrees.

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22. A 4 by 4 board consists of 16 unit squares. How many squares of all sizes have sides along the grid lines?

A. 16 B. 20 C. 25 D. 30 E. 40

Answer: D. 30

The possible side lengths are 1, 2, 3, and 4. A square of side k has $(5 - k)^2$ possible positions. The total is $16 + 9 + 4 + 1 = 30$.

23. Use the digits 1, 2, 3, and 4 exactly once to form two two-digit numbers. What is the smallest possible positive difference between the two numbers?

A. 3 B. 5 C. 7 D. 9 E. 11

Answer: C. 7

If the tens digits differ by at least 2, the difference is at least $20 - 3 = 17$. If they are consecutive, check the three possible pairs of tens digits. Tens 1 and 2 leave units 3 and 4, giving minimum difference 9; tens 2 and 3 leave 1 and 4, giving $10 - 3 = 7$; tens 3 and 4 give 9. Thus $31 - 24 = 7$ is the minimum.

24. Positive integers a and b satisfy $a + b = 12$. Their product is not divisible by 3. What is the greatest possible product?

A. 27 B. 30 C. 32 D. 35 E. 36

Answer: D. 35

Since $(a - b)^2 \geq 0$, we have $ab \leq (a + b)^2/4 = 36$, with equality only at $a = b = 6$. That pair is forbidden. The next integer below 36 is 35, and it is attained by 5 and 7. Since 35 is not divisible by 3, the greatest allowed product is 35.

25. Two players alternate removing 1, 2, or 3 stones from a pile of 30 stones. The player who removes the last stone wins. Which first move guarantees the first player a win if they continue to play correctly?

A. Remove 1 stone B. Remove 2 stones C. Remove 3 stones D. Any legal first move E. No first move guarantees a win

Answer: B. Remove 2 stones

Remove 2 stones, leaving 28. Whenever the opponent removes r stones, remove $4 - r$ stones. This is always a legal move and returns a multiple of 4 to the opponent, eventually leaving 0 after your move. A first move of 1 or 3 leaves 29 or 27; the opponent can then leave 28 or 24 and use the same strategy. Thus only removing 2 guarantees a win.