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Mathematics, 2015 EC, Grade 8 national exam

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Time allowed: 120 minutes | **Questions:** 40 | **Total marks:** 40

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1. The number $3\frac{1}{5}$ as a single fraction is equal to (1)

A. ✓ $\frac{16}{5}$
B. $\frac{4}{5}$
C. $\frac{14}{5}$
D. $\frac{9}{5}$

Answer: A
To convert the mixed fraction $3\frac{1}{5}$ to an improper fraction, multiply the whole number by the denominator and add the numerator: $\frac{3\times5+1}{5} = \frac{16}{5}$.

2. |-\frac{2}{3}| + \frac{1}{3} is equal to (1)

A. $\frac{1}{3}$
B. $\frac{2}{3}$
C. ✓ **1**
D. -1

Answer: C
The absolute value of $-\frac{2}{3}$ is $\frac{2}{3}$. Adding $\frac{1}{3}$ results in $\frac{2}{3} + \frac{1}{3} = \frac{3}{3} = 1$.

3. Which one of the following is true? (1)

A. ✓ $\frac{1}{2} < \frac{3}{5} < \frac{7}{10}$
B. $\frac{7}{10} < \frac{3}{5} < \frac{1}{2}$
C. $\frac{1}{2} < \frac{7}{10} < \frac{3}{5}$
D. $\frac{3}{5} < \frac{7}{10} < \frac{1}{2}$

Answer: A
Converting each fraction to a decimal gives $\frac{1}{2} = 0.5$, $\frac{3}{5} = 0.6$, and $\frac{7}{10} = 0.7$. Since $0.5 < 0.6 < 0.7$, the statement $\frac{1}{2} < \frac{3}{5} < \frac{7}{10}$ is true.

4. \frac{3}{7} + \frac{1}{2} = (1)

A. $\frac{5}{14}$
B. $\frac{4}{9}$
C. $\frac{2}{7}$
D. ✓ $\frac{13}{14}$

Answer: D
To add the fractions, find a common denominator, which is 14. This yields $\frac{3\times2}{14} + \frac{1\times7}{14} = \frac{6+7}{14} = \frac{13}{14}$.

5. The sum of two rational numbers is 3. If one of the numbers is $\frac{9}{4}$, then the other number is (1)

A. ✓ $\frac{3}{4}$
B. $\frac{21}{4}$
C. $\frac{1}{2}$
D. $\frac{2}{3}$

Answer: A
Subtract the given rational number from the total sum: $3 - \frac{9}{4} = \frac{12}{4} - \frac{9}{4} = \frac{3}{4}$.

6. $\left(-\frac{3}{4}\right) \times \left(-\frac{10}{9}\right) =$ (1)

A. $\frac{27}{40}$
B. ✓ $\frac{5}{6}$
C. $-\frac{27}{40}$
D. $-\frac{5}{6}$

> **Answer:** B
> The product of two negative numbers is positive. Multiplying the fractions gives $\frac{3\times10}{4\times9} = \frac{30}{36}$, which simplifies to $\frac{5}{6}$ by dividing both the numerator and denominator by 6.

7. If we divide $4\frac{1}{3}$ by $\frac{1}{6}$, the result is (1)

A. $4\frac{1}{18}$
B. ✓ **26**
C. 8
D. $\frac{13}{18}$

> **Answer:** B
> First, convert $4\frac{1}{3}$ to the improper fraction $\frac{13}{3}$. Then, dividing by $\frac{1}{6}$ is equivalent to multiplying by 6, which gives $\frac{13}{3} \times 6 = 26$.

8. A bag contained 8.2kg of three type fruits. 2.5kg orange, 2.2kg banana and the rest is apple. Then the amount of apple is (1)

A. 2.5kg
B. 2.8 kg
C. ✓ **3.5kg**
D. 4.2kg

> **Answer:** C
> Subtract the combined weight of the oranges and bananas from the total weight: $8.2\ \text{kg} - (2.5\ \text{kg} + 2.2\ \text{kg}) = 8.2\ \text{kg} - 4.7\ \text{kg} = 3.5\ \text{kg}$.

9. Which one of the following numbers is a squared number? (1)

A. 2
B. ✓ **4**
C. 6
D. 8

> **Answer:** B
> A squared number (perfect square) is an integer that can be expressed as the square of another integer. Among the choices, $4 = 2^2$ is the only squared number.

10. The area of a square is 196cm^2. What is the length of one side of the square? (1)

A. 11cm
B. 13cm
C. ✓ **14cm**
D. 19cm

> **Answer:** C
> The area of a square is given by $A = s^2$. Since $14^2 = 196$, the side length of the square is $14\ \text{cm}$.

11. 11. Table 1 yields the value $y = x^2, 1 \leq x \leq 1.49$ (1)

X	0	1	2	3	4	5	6	7	8	9
1.0	1.000	1.020	1.040	1.061	1.082	1.102	1.124	1.145	1.166	1.188
1.1	1.210	1.232	1.254	1.277	1.277	1.322	1.346	1.369	1.392	1.416
1.2	1.440	1.464	1.488	1.513	1.538	1.562	1.588	1.613	1.638	1.644
1.3	1.690	1.716	1.742	1.769	1.796	1.822	1.855	1.877	1.904	1.932
1.4	1.960	1.988	2.016	2.045	2.074	2.102	2.132	2.161	1.190	2.220

By using the table $\sqrt{2.016}$ is equal to

A. 1.32
B. 1.40
C. ✓ **1.42**
D. 1.46

> **Answer:** C
> Using the given table, look for 2.016 in the body of the table. It corresponds to the row $X = 1.4$ and column 2, which means $1.42^2 = 2.016$, hence $\sqrt{2.016} = 1.42$.

12. 12. $\left(\frac{3}{4}\right)^3 =$ ____ (1)

A. $\frac{9}{16}$
B. $\frac{27}{16}$
C. ✓ $\frac{27}{64}$
D. $\frac{9}{64}$

> **Answer:** C
> To cube a fraction, cube both the numerator and the denominator: $\left(\frac{3}{4}\right)^3 = \frac{3^3}{4^3} = \frac{27}{64}$.

13. 13. $\sqrt[3]{-64} =$ _____ (1)

A. 4
B. ✓ **-4**
C. -8
D. 8

> **Answer:** B
> The cube root of a negative number is negative, and since $(-4)^3 = -64$, the cube root of -64 is -4.

14. 14. The volume of cubic box with side length equal to $\frac{1}{2}$ m is (1)

A. $4\ \mathrm{m}^3$
B. $\frac{1}{4}\ \mathrm{m}^3$
C. ✓ $\frac{1}{8}\ \mathrm{m}^3$
D. $8\ \mathrm{m}^3$

> **Answer:** C
> The volume of a cube is calculated using the formula $V = s^3$, where s is the side length. Substituting $s = \frac{1}{2}$ m gives $V = (\frac{1}{2})^3 = \frac{1}{8}\ \mathrm{m}^3$.

15. A point (x, y) is located in the fourth quadrant. Then which one of the following is true about the coordinates of the point? (1)

A. $x > 0$ and $y > 0$
B. ✓ $x > 0$ **and** $y < 0$
C. $x < 0$ and $y > 0$
D. $x < 0$ and $y < 0$

> **Answer:** B
> In the Cartesian coordinate system, the fourth quadrant is located in the bottom-right region, where the x-coordinates are positive ($x > 0$) and the y-coordinates are negative ($y < 0$).

16. Which one of the following points is not on a line shown in Figure 1? (1)

[Figure: A Cartesian coordinate grid labeled "Figure 1" showing a straight line. The line has a positive slope and passes through the y-intercept at $(0, -3)$ and the x-intercept at $(3, 0)$, as well as points $(1, -2)$, $(2, -1)$, and $(4, 1)$.]

A. ✓ $(-1, -2)$
B. $(2, -1)$
C. $(3, 0)$
D. $(0, -3)$

Answer: A
The line shown in Figure 1 passes through $(3, 0)$ and $(0, -3)$, giving it a slope of $m = 1$ and equation $y = x - 3$. Substituting $x = -1$ into this equation yields $y = -4$, which shows that $(-1, -2)$ is not on the line.

17. The solution of $2x + 3 < x - 1$ is (1)

A. $x > 3$
B. $x < -3$
C. ✓ $x < -4$
D. $x < 2$

Answer: C
Subtracting x and 3 from both sides of the inequality $2x + 3 < x - 1$ yields $2x - x < -1 - 3$, which simplifies directly to $x < -4$.

18. The sum of two consecutive integers x and y is less than 55. If x is the smaller number in the sum, then (1)

A. $x < 54$
B. ✓ $x < 27$
C. $x > 54$
D. $x < 18$

Answer: B
Let the consecutive integers be x and $x + 1$. Their sum is $2x + 1 < 55$, which simplifies to $2x < 54$, or $x < 27$.

19. Sum of two numbers is 95. If one exceeds the other by 15, then the smaller number in the sum is (1)

A. 25
B. 30
C. 35
D. ✓ **40**

Answer: D
Let the smaller number be x, so the larger number is $x + 15$. Their sum is $x + (x + 15) = 95$, which simplifies to $2x = 80$, giving $x = 40$.

20. Which one of the following are not necessarily similar figures? (1)

A. Any two triangles with their corresponding angles are equal.
B. Any two triangles with their corresponding sides are equal.
C. Any two right angled triangles with one of their angles 35^0
D. ✓ **Any two triangles with their altitude are equal.**

Answer: D
Triangles with equal altitudes do not have to be similar because their base lengths and angles can vary independently, unlike triangles defined by AAA similarity or right-angled triangles with a shared acute angle.

21. Assume that ΔABC is similar to ΔDEF . If $AB = 7$, $AC = 15$, $DF = 6$and $EF = 4$ then $BC =$ _____ (1)

A. $\frac{14}{5}$
B. ✓ **10**
C. $\frac{56}{5}$
D. $\frac{24}{5}$

Answer: B
Since the triangles are similar, the ratio of corresponding sides is equal: $\frac{BC}{EF} = \frac{AC}{DF}$. Substituting the given values gives $\frac{BC}{4} = \frac{15}{6}$, which simplifies to $BC = 10$.

22. Assume that ΔABC is similar to ΔDEF. If $AB = 4\text{cm}$, $BC = 5\text{cm}$, $AC = 8\text{cm}$ and $DE = 8\text{cm}$, then perimeter of $\Delta DEF =$ _____ (1)

A. 17cm
B. 25cm
C. ✓ **34cm**
D. $\frac{17}{2}\text{cm}$

> **Answer:** C
> The perimeter of ΔABC is $4 + 5 + 8 = 17$ cm. Since the ratio of corresponding sides is $\frac{DE}{AB} = \frac{8}{4} = 2$, the perimeter of ΔDEF is $17 \times 2 = 34$ cm.

23. The ratio of the corresponding sides of similar triangles is $\frac{2}{3}$. If the area of the smaller triangle is 12cm^2, then the area of the larger triangle is (1)

A. ✓ 27cm^2
B. 16cm^2
C. 18cm^2
D. 15cm^2

> **Answer:** A
> The ratio of the areas of similar triangles is the square of the ratio of their corresponding sides: $\frac{A_{\text{small}}}{A_{\text{large}}} = (\frac{2}{3})^2 = \frac{4}{9}$. Setting $\frac{12}{A_{\text{large}}} = \frac{4}{9}$ yields $A_{\text{large}} = 27$ cm^2.

24. The degree measure of angles of a triangle are x^0, $2x^0$ and 60^0. Then the value of x is (1)

A. 10
B. 20
C. ✓ **40**
D. 50

> **Answer:** C
> The sum of the angles in any triangle is 180°. Therefore, $x + 2x + 60 = 180$, which simplifies to $3x = 120$ and gives $x = 40$.

25. In the Figure 2, shown below the degree measure of $\angle ACB$ is equal to (1)
[Figure: A triangle ABC is shown, labelled 'Figure 2'. Side BA is extended downwards past vertex A. The exterior angle between the extension of BA and side AC is labelled 135^0. The interior angle at vertex B is labelled $x + 5$. The interior angle at vertex C ($\angle ACB$) is labelled x.]

A. 30^0
B. 45^0
C. 60^0
D. ✓ 65^0

> **Answer:** D
> The exterior angle of a triangle is equal to the sum of its two opposite interior angles. Thus, $135^0 = (x + 5) + x$, which gives $2x = 130$, so $x = 65^0$.

26. In the Figure 3, below the value of x is (1)
[Figure: A right triangle is shown with its right angle at the top vertex, labelled 'Figure 3'. An altitude is drawn from the top right-angled vertex perpendicular to the bottom hypotenuse, dividing it into two segments of length 5 (left segment) and 15 (right segment). The left leg of the triangle is labelled x.]

A. 4
B. 6
C. ✓ **10**
D. $\sqrt{75}$

> **Answer:** C
> By the geometric mean theorem (or similarity of triangles), the leg x satisfies $x^2 = 5 \times (5 + 15) = 100$, which gives $x = 10$.

27. Which one of the following triplets does not represent lengths of sides of right angled triangle? (1)

A. ✓ **2cm, 3cm, 6cm**
B. 3cm, 4cm, 5cm
C. 5cm, 12cm, 13cm
D. 6cm, 8cm, 10cm

Answer: A
For a right-angled triangle, the side lengths must satisfy the Pythagorean theorem $a^2 + b^2 = c^2$. For option A, $2^2 + 3^2 = 13 \neq 6^2$ (furthermore, $2 + 3 < 6$, so these lengths cannot even form a triangle).

28. Consider the circle shown in the Figure 4. If O is the center of the circle, which one of the following is not true? (1)
[Figure: A circle with center labelled O is shown, labelled 'Figure 4'. A horizontal line with arrows at both ends, labelled with point A on the left and point B on the right, is tangent to the top of the circle at point D. A secant line passes through point D and another point C on the lower-left boundary of the circle, extending outside the circle with arrows at both ends; this line does not pass through the center O. A horizontal line segment inside the circle below center O connects point E on the left to point F on the right.]

A. Line $\overline{AB}$ is tangent line to the circle.
B. Line $\overline{CD}$ is a secant line to the circle.
C. Line segment $\overline{EF}$ is a chord of the circle.
D. ✓ **Line segment $\overline{CD}$ is a diameter.**

Answer: D
A diameter must pass through the center of the circle, but the secant line $\overline{CD}$ is described as not passing through the center O.

29. 29. In Figure 5 , if $m(\overparen{AB}) = 72^0$, then $m(\angle ACB)$ is __ (1)
[Figure: Figure 5 shows a circle with points A and B on the upper circumference, and point C on the lower-left circumference. Chords AC and BC meet at point C to form an inscribed angle ACB subtending arc AB, with the measure of arc AB indicated as 72°.]

A. ✓ 36^0
B. 45^0
C. 72^0
D. 144^0

Answer: A
An inscribed angle is half the measure of its intercepted arc, so $m(\angle ACB) = \frac{1}{2} m(\overparen{AB}) = \frac{1}{2} \times 72^0 = 36^0$.

30. 30. In the Figure 6, O is the center and $\overline{AB}$ a line segment that pass through O. If $m(\overparen{AE}) = 66^0$ and $(\overparen{ED}) = 49^0$ then $m(\angle DOB)$ is equal to (1)
[Figure: Figure 6 shows a circle with center O and diameter AB passing horizontally through O. On the upper semicircle, points E and D lie on the arc between A and B, with radii OE and OD drawn. A point C lies on the lower circumference with line segment OC drawn. Arc AE has a measure of 66° and arc ED has a measure of 49°.]

A. ✓ 65^0
B. 70^0
C. 72^0
D. 98^0

Answer: A
Since $\overline{AB}$ is a diameter, the arc AEB measures 180^0. Therefore, $m(\overparen{DB}) = 180^0 - (66^0 + 49^0) = 65^0$, and its central angle $m(\angle DOB)$ has the same measure of 65^0.

31. 31. A circular pizza in Figure 7 was cut into three parts in such a way that the arc length of each part are equal. What is the degree measure of $\angle BAC$? (1)

[Figure: Figure 7 depicts a circular pizza shown in perspective, divided into three sectors meeting at center point A. Radii AB and AC define a shaded sector BAC, where the arc lengths of all three sectors along the circumference are equal.]

A. 30^0 **B.** 45^0

C. 60^0 **D.** ✓ 120^0

> **Answer:** D
> Cutting a circle into three equal parts means each sector has a central angle of $360^0/3 = 120^0$. Since A is the center, $\angle BAC$ is a central angle and thus measures 120^0.

32. 32. In the prism shown in Figure 8, which one of the following is a base? (1)

[Figure: Figure 8 shows a triangular prism lying on its side. The front triangular face has vertices A (bottom-left), E (top-left), and B (bottom-right) connected by solid edges AE, EB, and AB. The rear triangular face has vertices C (bottom-left, hidden), F (top-right), and D (bottom-right) with edges CF and CD dashed, and edge FD solid. The lateral edges connecting corresponding vertices are EF (solid, top), BD (solid, bottom-right), and AC (dashed, bottom-left).]

A. Rectangle ABDC **B.** Rectangle EBDF

C. Rectangle AEFC **D.** ✓ **Triangle AEB**

> **Answer:** D
> In a triangular prism, the two parallel and congruent triangular faces are the bases, while the lateral faces are rectangles. Thus, Triangle AEB is a base.

33. The total surface area of a pyramid shown in Figure 9 is (1)

[Figure: A triangular prism labeled 'Figure 9'. The triangular face has perpendicular legs labeled 12cm (vertical) and 5cm (horizontal). The length of the prism extending between the two triangular bases is labeled 7cm.]

A. $420\ \text{cm}^2$ **B.** $300\ \text{cm}^2$

C. ✓ $270\ \text{cm}^2$ **D.** $179\ \text{cm}^2$

> **Answer:** C
> Despite the typo using the word 'pyramid' instead of 'prism', the total surface area of this triangular prism is calculated by $2 \times \text{Base Area} + \text{Lateral Area} = 2 \times (\frac{1}{2} \times 12 \times 5) + (5 + 12 + 13) \times 7 = 60 + 210 = 270\ \text{cm}^2$.

34. The total surface area of a cylinder with radius 1m and height 3m is (1)

A. $2\pi\ \text{m}^2$ **B.** $3\pi\ \text{m}^2$

C. ✓ $8\pi\ \text{m}^2$ **D.** $9\pi\ \text{m}^2$

> **Answer:** C
> The total surface area of a cylinder is $2\pi r(r + h) = 2\pi(1)(1 + 3) = 8\pi\ \text{m}^2$.

35. The volume of a right circular cylinder with height 3cm and base radius 2cm is (1)

A. $6\pi\ \text{cm}^3$ **B.** ✓ $12\pi\ \text{cm}^3$

C. $16\pi\ \text{cm}^3$ **D.** $20\pi\ \text{cm}^3$

> **Answer:** B
> The volume of a cylinder is given by $V = \pi r^2 h = \pi(2^2)(3) = 12\pi\ \text{cm}^3$.

36. A cylindrical tanker of radius 2m and height 4m contains $8\pi\ \text{m}^3$ water. How much cubic meter of water is required to fill the tanker? (1)

A. $2\pi\ \text{m}^3$ **B.** $6\pi\ \text{m}^3$

C. $4\pi\ \text{m}^3$ **D.** ✓ $8\pi\ \text{m}^3$

> **Answer:** D
> The total capacity of the tanker is $V = \pi r^2 h = \pi(2^2)(4) = 16\pi\ \text{m}^3$. Since it already contains $8\pi\ \text{m}^3$, the volume of water needed to fill it is $16\pi - 8\pi = 8\pi\ \text{m}^3$.

37. The probability of an impossible event is (1)

A. ✓ **0** **B.** $\frac{1}{4}$

C. $\frac{1}{2}$ **D.** 1

> **Answer:** A
> The probability of an impossible event is 0, as it cannot occur under any circumstances, while the probability of a certain event is 1.

38. The probability of choosing a letter 'I' randomly from the letters of the word 'PHILIPPINES' is (1)

A. ✓ $\frac{3}{11}$ **B.** $\frac{3}{7}$

C. $\frac{4}{9}$ **D.** $\frac{5}{11}$

> **Answer:** A
> The word 'PHILIPPINES' contains 11 letters in total, with the letter 'I' appearing exactly 3 times. Thus, the probability of randomly choosing the letter 'I' is the number of 'I's divided by the total number of letters, which is 3/11.

39. 39. A box contains 12 cards numbered from 1 to 12. One card is drawn randomly from the box. The probability of the number to be odd is (1)

A. $\frac{1}{12}$ **B.** ✓ $\frac{1}{2}$

C. $\frac{2}{3}$ **D.** $\frac{1}{4}$

> **Answer:** B
> Among the numbers from 1 to 12, there are 6 odd numbers (1, 3, 5, 7, 9, 11) and 6 even numbers. Therefore, the probability of drawing an odd card is 6/12, which simplifies to 1/2.

40. 40. Assume that the arrow in Figure 10 point to the numbers 1,2,3,...12 only. What is the probability of pointing to an odd number? (1)

[Figure: Figure 10 shows a circular dial resembling a clock face with tick marks and the numbers 1 through 12 arranged clockwise around the circumference (12 at the top, 3 at the right, 6 at the bottom, and 9 at the left). A pointer originates at the center and points toward the number 2.]

A. ✓ $\frac{1}{2}$ **B.** $\frac{1}{12}$

C. $\frac{3}{4}$ **D.** $\frac{2}{3}$

> **Answer:** A
> Since the arrow is equally likely to point to any of the 12 numbers (1 through 12) on the dial, and exactly 6 of these numbers are odd (1, 3, 5, 7, 9, and 11), the probability of the pointer landing on an odd number is 6/12, which is 1/2.

END OF THE MARKING KEY

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