NMMS Gujarat Mathematics

Sample Paper – 9

Duration: 20 Minutes **Maximum Marks: 20**

Instructions

- This paper contains **20** Multiple Choice Questions (Single Correct Answer), modelled on the Mathematics portion of **NMMS Gujarat** (National Means-cum-Merit Scholarship).
- Each correct answer carries **+1 mark**. There is **no negative marking** for incorrect or unattempted answers.
- Only **one** option is correct per question.
- Syllabus level: **Class 7 & 8 Mathematics — NCERT / GSEB curriculum.**
- Use of mobile phones, calculators, or electronic gadgets is strictly prohibited during the examination.

Q1. Find the product: $\left(\frac{-7}{3}\right) \times \left(\frac{9}{14}\right)$

(A) $\frac{3}{2}$

(B) $\frac{-2}{3}$

(C) $\frac{2}{3}$

(D) $\frac{-3}{2}$

Q2. Which of the following is the best estimate of $\sqrt{50}$?

(A) 6.5

(B) 7.1

(C) 7.5

(D) 8.0

Q3. The volume of a cube is $729\ \text{cm}^3$. Find the length of one side.

(A) 9 cm

(B) 12 cm

(C) 15 cm

(D) 27 cm

Q4. Simplify: $\left(\frac{5}{3}\right)^2 \times \left(\frac{3}{5}\right)^3$

(A) $\frac{5}{3}$

(B) $\frac{9}{25}$

(C) $\frac{3}{5}$

(D) $\frac{25}{9}$

Q5. Solve for x: $\frac{x}{3} + 5 = \frac{x}{2} - 1$

(A) 18

(B) 36

(C) 24

(D) 12

Q6. If $x = 2$ and $y = -3$, find the value of $x^3 - y^2 + 2xy$.

(A) -3

(B) -11

(C) 13

(D) -13

Q7. Factorize by grouping: $ax + ay + bx + by$

(A) $(a + b)(x + y)$

(B) $(a - b)(x + y)$

(C) $(ax + b)(x + y)$

(D) $(a + b)(x - y)$

Q8. Subtract $(2x^2 + x - 4)$ from $(5x^2 - 3x + 7)$.

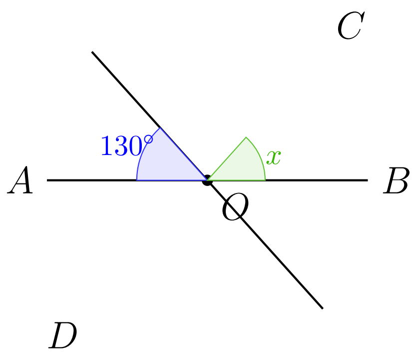
(A) $3x^2 + 4x + 3$

(B) $3x^2 - 4x - 3$

(C) $3x^2 - 4x + 11$

(D) $7x^2 - 2x + 3$

Q9. In the figure, lines AB and CD intersect at point O. If $\angle AOC = 130°$, find $\angle BOC$.



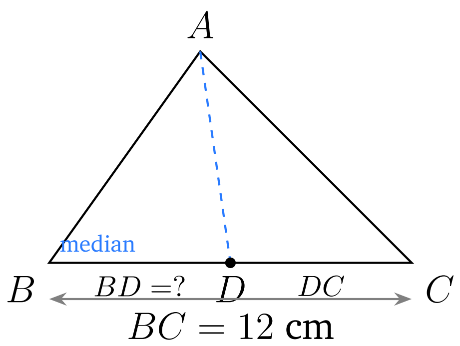
(A) $130°$

(B) $50°$

(C) $40°$

(D) $90°$

Q10. In triangle ABC, D is the midpoint of BC. If $BC = 12$ cm, find BD.



(A) 5 cm

(B) 7 cm

(C) 4 cm

(D) 6 cm

Q11. In two right-angled triangles, the hypotenuse and one leg are respectively equal. The congruence criterion that applies is:

(A) RHS (Right angle – Hypotenuse – Side)

(B) SAS (Side – Angle – Side)

(C) ASA (Angle – Side – Angle)

(D) AAS (Angle – Angle – Side)

Q12. In trapezium $ABCD$, $AB \parallel CD$, $AB = 10$ cm and $CD = 6$ cm. Find the length of the midsegment (the line joining the midpoints of the non-parallel sides).

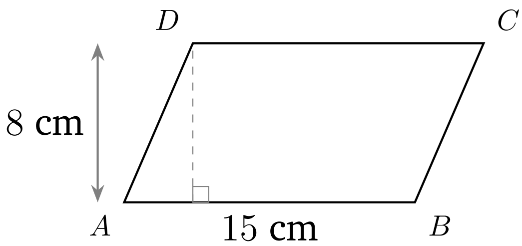
(A) 4 cm

(B) 6 cm

(C) 8 cm

(D) 16 cm

Q13. Find the area of the parallelogram $ABCD$ shown below, with base 15 cm and height 8 cm.



(A) 60 cm^2

(B) 120 cm^2

(C) 150 cm^2

(D) 240 cm^2

Q14. Find the total surface area of a cube with side length 5 cm.

(A) 25 cm^2

(B) 75 cm^2

(C) 125 cm^2

(D) 150 cm^2

Q15. Find the volume of a cone with radius 7 cm and height 24 cm. $\left(\pi = \dfrac{22}{7}\right)$

(A) 1232 cm^3

(B) 1540 cm^3

(C) 2464 cm^3

(D) 4620 cm^3

Q16. An article costs Rs. 1500 and is sold for Rs. 1800. Find the profit percentage.

(A) 15%

(B) 18%

(C) 20%

(D) 25%

Q17. A shopkeeper marks an article at Rs. 1200 and gives a discount of 20%. Find the selling price.

(A) Rs. 240

(B) Rs. 960

(C) Rs. 1000

(D) Rs. 1100

Q18. Find the Simple Interest on Rs. 8000 at 7.5% p.a. for 3 years.

(A) Rs. 600

(B) Rs. 1200

(C) Rs. 1500

(D) Rs. 1800

Q19. The following table shows the marks of 10 students. Find the mean marks.

Marks	10	20	30	40
Frequency	2	3	4	1

(A) 24

(B) 25

(C) 26

(D) 30

Q20. A bag contains 3 red balls, 5 blue balls, and 2 green balls. One ball is drawn at random. What is the probability of drawing a blue ball?

(A) $\frac{1}{5}$

(B) $\frac{2}{5}$

(C) $\frac{1}{2}$

(D) $\frac{3}{5}$

Detailed Solutions

Q1.

Solution

Concept — Multiplication of Rational Numbers: Multiply numerators together and denominators together, then simplify.

Step 1 — Multiply:

$$\frac{-7}{3} \times \frac{9}{14} = \frac{(-7) \times 9}{3 \times 14} = \frac{-63}{42}$$

Step 2 — Simplify (divide numerator and denominator by 21):

$$\frac{-63}{42} = \frac{-3}{2}$$

Why other options are wrong:

- Option A: $\frac{3}{2}$ — correct magnitude but wrong sign.
- Option B: $\frac{-2}{3}$ — inverted result.
- Option C: $\frac{2}{3}$ — inverted and wrong sign.

Final Answer: $\frac{-7}{3} \times \frac{9}{14} = \frac{-3}{2} \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q1

Q2.

Solution

Concept — Estimating Square Roots by Bounding: Find perfect squares immediately below and above the given number.

Step 1 — Identify bounds:

$$7^2 = 49 \quad \text{and} \quad 8^2 = 64$$

Since $49 < 50 < 64$, we have $7 < \sqrt{50} < 8$.

Step 2 — Narrow the estimate: 50 is very close to 49, so $\sqrt{50} \approx 7.07$. The closest given option is **7.1**.

Why other options are wrong:

- Option A: $6.5^2 = 42.25$ — too small.

- Option C: $7.5^2 = 56.25$ — too large.
- Option D: $8.0^2 = 64$ — $\sqrt{64} = 8$, not $\sqrt{50}$.

Final Answer: $\sqrt{50} \approx 7.1 \Rightarrow \boxed{\text{B}}$

$\boxed{\textbf{Answer: (B)}}$ Go Back to Q2

Q3.

Solution

Concept — Cube Root to Find Side of Cube: Volume of cube $= s^3$, so $s = \sqrt[3]{\text{Volume}}$.

Step 1 — Find the cube root of 729:

$$729 = 9^3 \quad (\text{since } 9 \times 9 = 81,\ 81 \times 9 = 729)$$

Step 2 — State the side length:

$$s = \sqrt[3]{729} = 9 \text{ cm}$$

Why other options are wrong:

- Option B: $12^3 = 1728 \neq 729$.
- Option C: $15^3 = 3375 \neq 729$.
- Option D: 27 — note $27^3 = 19683$; but $27 = 3^3$, and $\sqrt[3]{729} = 9$, not 27.

Final Answer: Side $= 9$ cm $\Rightarrow \boxed{\text{A}}$

$\boxed{\textbf{Answer: (A)}}$ Go Back to Q3

Q4.

Solution

Concept — Laws of Exponents with Fractions: $\left(\frac{a}{b}\right)^m \times \left(\frac{a}{b}\right)^n = \left(\frac{a}{b}\right)^{m+n}$.

Step 1 — Rewrite using the same base:

$$\left(\frac{5}{3}\right)^2 \times \left(\frac{3}{5}\right)^3 = \left(\frac{5}{3}\right)^2 \times \left(\frac{5}{3}\right)^{-3}$$

Step 2 — Apply the product rule:

$$\left(\frac{5}{3}\right)^{2+(-3)} = \left(\frac{5}{3}\right)^{-1} = \frac{3}{5}$$

Why other options are wrong:

- Option A: $\frac{5}{3}$ — would require exponent $+1$, not -1.
- Option B: $\frac{9}{25} = \left(\frac{3}{5}\right)^2$ — exponent is -2, not -1.
- Option D: $\frac{25}{9} = \left(\frac{5}{3}\right)^2$ — exponent is $+2$, not -1.

Final Answer: $\left(\frac{5}{3}\right)^2 \times \left(\frac{3}{5}\right)^3 = \frac{3}{5} \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q4

Q5.

Solution

Concept — Linear Equations with Fractional Coefficients (LCM Method): Multiply through by the LCM of the denominators to clear fractions.

Step 1 — Multiply every term by LCM$(2, 3) = 6$:

$$6 \times \frac{x}{3} + 6 \times 5 = 6 \times \frac{x}{2} - 6 \times 1 \implies 2x + 30 = 3x - 6$$

Step 2 — Solve:

$$30 + 6 = 3x - 2x \implies x = 36$$

Verify: LHS $= \frac{36}{3} + 5 = 12 + 5 = 17$; RHS $= \frac{36}{2} - 1 = 18 - 1 = 17$ ✓

Why other options are wrong:

- Option A: $x = 18$: LHS $= 6 + 5 = 11$; RHS $= 9 - 1 = 8$. Not equal.
- Option C: $x = 24$: LHS $= 8 + 5 = 13$; RHS $= 12 - 1 = 11$. Not equal.
- Option D: $x = 12$: LHS $= 4 + 5 = 9$; RHS $= 6 - 1 = 5$. Not equal.

Final Answer: $x = 36 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q5

Q6.

Solution

Concept — Evaluating an Expression with Negative Values: $x = 2$, $y = -3$.

Step 1 — Compute each term carefully:

$$x^3 = (2)^3 = 8$$

$$y^2 = (-3)^2 = 9 \quad \text{(note: squaring removes the negative sign)}$$

$$2xy = 2(2)(-3) = -12$$

Step 2 — Combine:

$$x^3 - y^2 + 2xy = 8 - 9 + (-12) = 8 - 9 - 12 = -13$$

Why other options are wrong:

- Option A: $-3 = 8 - 9 - 2$ — computes $2xy$ as -2 (using xy not $2xy$).
- Option B: $-11 = 8 - 9 - 10$ — error in computing $2xy$.
- Option C: 13 — sign error; ignores the negative on $2xy$.

Final Answer: $x^3 - y^2 + 2xy = -13 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q6

Q7.

Solution

Concept — Factorisation by Grouping: Group terms in pairs so that a common factor emerges from each pair.

Step 1 — Group in pairs:

$$ax + ay + bx + by = (ax + ay) + (bx + by)$$

Step 2 — Factor each group:

$$= a(x + y) + b(x + y)$$

Step 3 — Factor out the common binomial:

$$= (a + b)(x + y)$$

Why other options are wrong:

- Option B: $(a - b)(x + y) = ax + ay - bx - by$ — signs of bx and by are wrong.
- Option C: $(ax + b)(x + y) = ax^2 + axy + bx + by$ — not equivalent.
- Option D: $(a + b)(x - y) = ax - ay + bx - by$ — signs of ay and by are wrong.

Final Answer: $(a + b)(x + y) \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q7

Q8.

Solution

Concept — Subtracting Algebraic Expressions: Change the signs of all terms in the subtracted expression, then add.

Step 1 — Change signs of $(2x^2 + x - 4)$:

$$(5x^2 - 3x + 7) - (2x^2 + x - 4) = 5x^2 - 3x + 7 - 2x^2 - x + 4$$

Step 2 — Collect like terms:

$$x^2\text{-terms: } 5x^2 - 2x^2 = 3x^2$$

$$x\text{-terms: } -3x - x = -4x$$

$$\text{Constants: } 7 + 4 = 11$$

$$\text{Result: } 3x^2 - 4x + 11$$

Why other options are wrong:

- Option A: $3x^2 + 4x + 3$ — sign error on x term (uses $-3x + x = +4x$ incorrectly).
- Option B: $3x^2 - 4x - 3$ — constant: $7 - 4 = 3$, not $7 + 4 = 11$ (forgot sign change on -4).
- Option D: $7x^2 - 2x + 3$ — adds instead of subtracts the x^2 terms.

Final Answer: $3x^2 - 4x + 11 \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q8

Q9.

Solution

Concept — Supplementary Angles on a Straight Line: Angles on a straight line add up to $180°$.

Step 1 — Identify the relationship: $\angle AOC$ and $\angle BOC$ are supplementary (they lie on straight line AB, with O as the vertex).

$$\angle AOC + \angle BOC = 180°$$

Step 2 — Solve:

$$130° + \angle BOC = 180° \implies \angle BOC = 50°$$

Why other options are wrong:

- Option A: $130°$ — this would be the vertically opposite angle to $\angle AOC$ (i.e. $\angle BOD$), not $\angle BOC$.
- Option C: $40°$ — $130 + 40 = 170 \neq 180$.
- Option D: $90°$ — $130 + 90 = 220 \neq 180$; also, lines are not perpendicular here.

Final Answer: $\angle BOC = 50° \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q9

Q10.

Solution

Concept — Median of a Triangle (Midpoint of the Opposite Side): A median connects a vertex to the midpoint of the opposite side. Since D is the midpoint of BC, it divides BC into two equal halves.

Step 1 — Apply the midpoint property:

$$BD = DC = \frac{BC}{2} = \frac{12}{2} = 6 \text{ cm}$$

Why other options are wrong:

- Option A: 5 cm — does not satisfy $BD + DC = 12$ if $DC = 7$.
- Option B: 7 cm — $BD + DC = 7 + 5 = 12$, but $BD \neq DC$, contradicting that D is the midpoint.
- Option C: 4 cm — $BD + DC = 4 + 8 = 12$, but again $BD \neq DC$.

Final Answer: $BD = 6$ cm $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q10

Q11.

Solution

Concept — RHS Congruence Criterion: Two right-angled triangles are congruent if the hypotenuse and one leg (any one leg) of one triangle are equal to the hypotenuse and the corresponding leg of the other.

Why RHS and not the others:

- The right angle is given (at the right-angle vertex of each triangle).
- The hypotenuse is given equal.
- One leg is given equal.
- This matches exactly the RHS (Right angle – Hypotenuse – Side) criterion.
- SAS needs two sides and the *included* angle: the right angle here is not between the hypotenuse and a leg.
- ASA and AAS require two angles and a side: only one angle (the right angle) plus two sides are given.

Final Answer: RHS (Right angle – Hypotenuse – Side) $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q11

Q12.

Solution

Concept — Midsegment (Midline) of a Trapezium: The midsegment of a trapezium is parallel to the two parallel sides and equals half their sum.

$$\text{Midsegment} = \frac{AB + CD}{2}$$

Step 1 — Substitute $AB = 10$ cm and $CD = 6$ cm:

$$\text{Midsegment} = \frac{10+6}{2} = \frac{16}{2} = 8 \text{ cm}$$

Why other options are wrong:

- Option A: 4 cm $= \frac{AB-CD}{2}$ — uses difference instead of sum.
- Option B: 6 cm — this is CD, not the midsegment.
- Option D: 16 cm $= AB + CD$ — forgets to divide by 2.

Final Answer: Midsegment $= 8$ cm $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q12

Q13.

Solution

Concept — Area of a Parallelogram:

$$\text{Area} = \text{base} \times \text{height}$$

Step 1 — Substitute base $= 15$ cm and height $= 8$ cm:

$$\text{Area} = 15 \times 8 = 120 \text{ cm}^2$$

Why other options are wrong:

- Option A: 60 cm$^2 = \frac{1}{2} \times 15 \times 8$ — uses the triangle formula instead.
- Option C: 150 cm^2 — arithmetic error (perhaps 15×10).
- Option D: 240 cm$^2 = 2 \times 15 \times 8$ — doubles the area unnecessarily.

Final Answer: Area $= 120$ cm$^2 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q13

Q14.

Solution

Concept — Total Surface Area of a Cube: A cube has 6 identical square faces, each of area a^2.

$$\text{TSA} = 6a^2$$

Step 1 — Substitute $a = 5$ cm:

$$\text{TSA} = 6 \times 5^2 = 6 \times 25 = 150 \text{ cm}^2$$

Why other options are wrong:

- Option A: $25 \text{ cm}^2 = a^2$ — area of only one face.
- Option B: $75 \text{ cm}^2 = 3a^2$ — area of only 3 faces.
- Option C: $125 \text{ cm}^2 = a^3$ — this is the volume, not the surface area.

Final Answer: $\text{TSA} = 150 \text{ cm}^2 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q14

Q15.

Solution

Concept — Volume of a Cone:

$$V = \frac{1}{3}\pi r^2 h$$

Step 1 — Substitute $r = 7$ cm, $h = 24$ cm, $\pi = \frac{22}{7}$:

$$V = \frac{1}{3} \times \frac{22}{7} \times 7^2 \times 24 = \frac{1}{3} \times \frac{22}{7} \times 49 \times 24 = \frac{1}{3} \times 22 \times 7 \times 24$$

Step 2 — Simplify:

$$= \frac{22 \times 7 \times 24}{3} = \frac{3696}{3} = 1232 \text{ cm}^3$$

Why other options are wrong:

- Option B: $1540 \text{ cm}^3 = \pi r^2 \times 10$ — incorrect height and no $\frac{1}{3}$.
- Option C: $2464 \text{ cm}^3 = 2 \times 1232$ — doubles the result.
- Option D: $4620 \text{ cm}^3 = \pi r^2 h$ (without $\frac{1}{3}$) — forgets to divide by 3.

Final Answer: Volume $= 1232\ \text{cm}^3 \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q15

Q16.

Solution

Concept — Profit Percentage:

$$\text{Profit\%} = \frac{\text{SP} - \text{CP}}{\text{CP}} \times 100$$

Step 1 — Calculate profit:

$$\text{Profit} = 1800 - 1500 = \text{Rs.}\,300$$

Step 2 — Calculate profit%:

$$\text{Profit\%} = \frac{300}{1500} \times 100 = 20\%$$

Why other options are wrong:

- Option A: $15\% \Rightarrow \text{profit} = 225;\ \text{SP} = 1725 \neq 1800.$
- Option B: $18\% \Rightarrow \text{profit} = 270;\ \text{SP} = 1770 \neq 1800.$
- Option D: $25\% \Rightarrow \text{profit} = 375;\ \text{SP} = 1875 \neq 1800.$

Final Answer: $\text{Profit\%} = 20\% \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q16

Q17.

Solution

Concept — Selling Price after Discount:

$$\text{SP} = \text{MP} \times \left(\frac{100 - \text{Discount\%}}{100}\right)$$

Step 1 — Substitute Marked Price $= 1200$ **and Discount** $= 20\%$**:**

$$\text{SP} = 1200 \times \frac{100 - 20}{100} = 1200 \times \frac{80}{100} = 1200 \times 0.8 = \text{Rs.}\,960$$

Why other options are wrong:

- Option A: Rs. 240 — this is the discount amount itself (20% of 1200), not the SP.
- Option C: Rs. 1000 — implies discount $= 200 = 16.67\%$, not 20%.
- Option D: Rs. 1100 — implies discount $= 100 = 8.33\%$, not 20%.

Final Answer: SP $=$ Rs. $960 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q17

Q18.

Solution

Concept — Simple Interest Formula:

$$\text{SI} = \frac{P \times R \times T}{100}$$

Step 1 — Substitute $P = 8000$, $R = 7.5\%$, $T = 3$ years:

$$\text{SI} = \frac{8000 \times 7.5 \times 3}{100} = \frac{180000}{100} = \text{Rs. } 1800$$

Why other options are wrong:

- Option A: Rs. $600 = \frac{8000 \times 7.5 \times 1}{100}$ — for $T = 1$ year only.
- Option B: Rs. 1200 — would require rate $\approx 5\%$ for 3 years.
- Option C: Rs. $1500 = \frac{8000 \times 6.25 \times 3}{100}$ — uses incorrect rate.

Final Answer: SI $=$ Rs. $1800 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q18

Q19.

Solution

Concept — Mean from a Frequency Distribution Table:

$$\text{Mean} = \frac{\sum f_i x_i}{\sum f_i}$$

Step 1 — Calculate $f_i x_i$ for each class:

$$2 \times 10 = 20, \quad 3 \times 20 = 60, \quad 4 \times 30 = 120, \quad 1 \times 40 = 40$$

Step 2 — Sum and divide:

$$\sum f_i x_i = 20 + 60 + 120 + 40 = 240$$

$$\sum f_i = 2 + 3 + 4 + 1 = 10$$

$$\text{Mean} = \frac{240}{10} = 24$$

Why other options are wrong:

- Option B: $25 \Rightarrow$ sum would need to be $250 \neq 240$.
- Option C: $26 \Rightarrow$ sum would need to be $260 \neq 240$.
- Option D: 30 — arithmetic mean of the marks values $(10 + 20 + 30 + 40)/4 = 25$, not even equal to this.

Final Answer: Mean $= 24 \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q19

Q20.

Solution

Concept — Basic Probability:

$$P(\text{event}) = \frac{\text{Number of favourable outcomes}}{\text{Total number of outcomes}}$$

Step 1 — Count the outcomes: Red $= 3$, Blue $= 5$, Green $= 2$. Total $= 10$ balls.

Step 2 — Find P(blue):

$$P(\text{blue}) = \frac{5}{10} = \frac{1}{2}$$

Why other options are wrong:

- Option A: $\frac{1}{5}$ — probability of drawing a green ball ($\frac{2}{10}$), not blue.
- Option B: $\frac{2}{5}$ — numerator 4 (not 5) of blues would give this; or probability with 4 blue balls in 10.
- Option D: $\frac{3}{5}$ — probability of drawing a red ball is $\frac{3}{10}$; $\frac{3}{5}$ would need 6 blues.

Final Answer: $P(\text{blue}) = \dfrac{1}{2} \Rightarrow \boxed{\text{C}}$

$\boxed{\textbf{Answer: (C)}}$ **Go Back to Q20**

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	D	2	B	3	A	4	C	5	B
6	D	7	A	8	C	9	B	10	D
11	A	12	C	13	B	14	D	15	A
16	C	17	B	18	D	19	A	20	C