MPT 1

Basic Arithmetic (5 Questions)

1. $584 + 356 + 217 =$
   A) 1257   B) 1247   C) 1057   D) 1157   E) 114

2. $785 - 346 - 46 =$
   A) 485   B) 393   C) 493   D) 383   E) 531

3. $46 \times 83 =$
   A) 3708   B) 3508   C) 3718   D) 3808   E) 3818

4. Divide 1961 by 37 (find the quotient $\frac{1961}{37}$)
   A) 63   B) 53   C) 52   D) 73   E) 62

5. $5.6 \times 0.075 =$
   A) 0.42   B) 4.2   C) 0.042   D) 0.0042   E) 42

LCM & GCD (2 Questions)

6. The greatest common divisor of 300 and 360 is:
   A) 100   B) 50   C) 10   D) 60   E) 20

7. The lowest common multiple of 252 and 294 is:
   A) 1512   B) 10584   C) 42   D) 1764   E) 74088

Percentages (2 Questions)

8. What is 85% of 120?
   A) 102   B) 98   C) 100   D) 105   E) 97

9. What percentage of 250 is 45?
   A) 20%   B) 500%   C) 18%   D) 30%   E) 50%

Common Logic (3 Questions)

10. John is 20 years older than Mary. In 5 years he will be 3 times as old as Mary. How old is John?
    A) 45   B) 35   C) 25   D) 30   E) 40

11. If 3 oranges cost $2.91 then 5 oranges cost:
    A) $4.85   B) $14.55   C) $4.35   D) $3.85   E) $5.91

12. If Bob can build a wall in 2 hours and Carl can build the same wall in 3 hours, how many hours would it take for them to build the wall together?

    A) 5   B) $\frac{6}{5}$ C) 1   D) $\frac{4}{3}$ E) $\frac{3}{5}$

Rational Numbers (4 Questions)

13. $\dfrac{1}{3} + \dfrac{1}{7} + \dfrac{4}{21} =$ A) $\dfrac{2}{3}$ B) $\dfrac{8}{21}$ C) $\dfrac{4}{7}$ D) $\dfrac{3}{7}$ E) $\dfrac{16}{21}$

14. $\dfrac{3 + \dfrac{3}{5}}{4 + \dfrac{4}{5}} =$

    A) $\dfrac{2}{5}$ B) $\dfrac{3}{5}$ C) $\dfrac{3}{4}$ D) $\dfrac{7}{8}$ E) $\dfrac{7}{15}$

15. $\left(\dfrac{3}{4} - \dfrac{1}{6}\right)\cdot\left(\dfrac{3}{4} + \dfrac{1}{6}\right) =$ A) $\dfrac{5}{12}$ B) $\dfrac{93}{144}$ C) $\dfrac{1}{3}$ D) $\dfrac{7}{12}$ E) $\dfrac{77}{144}$

16. $\dfrac{3}{13} + \dfrac{10}{13} \div \dfrac{5}{13} =$ A) $\dfrac{5}{13}$ B) $\dfrac{29}{13}$ C) $\dfrac{13}{5}$ D) $\dfrac{13}{29}$ E) $\dfrac{7}{5}$

Basic Functions (3 Questions)

17. If f(x)$= 3x^2 - x + \dfrac{1}{8}$, then $f\left(-\tfrac{1}{3}\right) =$

    A) $\dfrac{2}{3}$ B) $\dfrac{9}{8}$ C) $\dfrac{25}{24}$ D) $\dfrac{1}{8}$ E) $\dfrac{19}{24}$

18. If f(x)$= \sqrt{2x^2 - x + \dfrac{1}{8}}$ then $f\left(-\tfrac{3}{4}\right)$ is

    A) 2   B) $\dfrac{1}{2}$ C) $\sqrt{2}$ D) $\dfrac{1}{8}$ E) is not a real number

19. Function $f(x) = \dfrac{(x-2)(x-3)}{(x+5)(x+6)}$ is defined for:
    A) All x such that $x \neq 5$ and $x \neq 6$
    B) All x such that $x \neq 2$ and $x \neq 3$
    C) All x such that $x \neq -5$ and $x \neq -6$
    D) All x such that $x \neq -5, x \neq -6, x \neq 2, x \neq 3$
    E) All real numbers x.

Polynomials (2 Questions)

20. $(3x^2 - 6x + 1)(2x + 3) =$
    A) $6x^3 - 19x^2 + 16x + 3$ B) $6x^3 - 3x^2 - 16x + 3$ C) $6x^3 + 3x^2 - 13x + 3$
    D) $6x^3 - 3x^2 + 16x + 3$ E) $6x^3 + 19x^2 - 3x + 3$

21. $(3x^2 - 5x + 2) - (4x - 5) =$

    A) $3x^2 - 9x - 3$ B) $12x^2 - x + 7$ C) $3x^2 - 9x + 7$ D) $12x^3 - 20x^2 - 25x + 10$ E) $3x^2 - x - 3$

Rational Expressions (2 Questions)

22. If $\dfrac{2}{2x+3} = \dfrac{4}{3x+4}$ then $\dfrac{6}{4x+5} =$

    A) 3   B) 1   C) -1 D) 2   E) -2

23. $\dfrac{x-2}{x+1} - \dfrac{x-2}{2x-3} =$

    A) 0   B) $\dfrac{x^2-6x+4}{2x^2-3}$ C) $\dfrac{(x-4)(x-2)}{(x+1)((2x-3)}$ D) $\dfrac{(x-3)(x-1)}{(x+1)(2x-3)}$ E) $\dfrac{(x-2)^2}{(x+1)(2x-3)}$

Square of a Binomial (2 Questions)

24. $(x-2y)^2 =$

    A) $x^2 - 2y^2$ B) $x^2 - 4y^2$ C) $x^2 - 2xy - 2y^2$ D) $x^2 - 4xy - 4y^2$ E) $x^2 - 4xy + 4y^2$

25. $(\sqrt{3} + \sqrt{12})^2 =$

    A) 15   B) 6   C) 27   D) $9\sqrt{3}$ E) $3 + 4\sqrt{3}$

Linear Equations (2 Questions)

26. Let $(5x - 17) + 4(x+2) - 3(x-5) = -2(x-1) + 7(x+1)$ Then $x =$

    A) 29   B) -19   C) 1   D) $\dfrac{29}{11}$ E) 3

27. Suppose that there is a pair of numbers x and y such that 2x + 3y = 51 and 3x + 5y = 84. Then x + y equals

    A) -3 B) 22   C) 135   D) 18   E) 0

Roots & Exponents (3 Questions)

28. $\sqrt{14500}$ is in the interval:

    A) (100,110)   B) (110,120)   C) (120,130)   D) (130,140)   E) (140,150)

29. $\sqrt[3]{-27} =$

    A) 9   B) -3   C) -9   D) 3   E) not a real number

30. If $\dfrac{(x^{-3} \cdot x^{-5})^{-2}}{\left(x^{-6} \cdot x^{-10}\right)^{-3}} = x^b$ then b equals

    A) -24 B) $\dfrac{1}{2}$ C) 1   D) 3   E) -32

Answers

1. D)

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584   (Carried 1 from the units column
356   and 1 from the tens column)
217
 1 1
1157
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2. B)

```
    7
 785   (Borrowed 1 from the tens   439
-346   column)                     -46
 439                               393
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3. E)

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  46
  83
 138
 368
3818
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4. B)

```
        53
 37)1961
    185
    111
    111
      0
```

5. A)

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  56        Then move the decimal point 4 to the left
  75        (one olace for 5.6 and three places for 0.075)
 280        so that:
 392        5.6 x 0.076 = 0.42
4200
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6. D) $300 = 3 \times 100 = 2^2 \times 3 \times 5^2$, $360 = 2^3 \times 3^2 \times 5 \xrightarrow{yields} g.c.d = 2^2 \times 3 \times 5 = 60$

7. D) $252 = 2^2 \times 3^2 \times 7$, $294 = 2 \times 3 \times 7^2 \xrightarrow{yields} l.c.m = 2^2 \times 3^2 \times 7^2 = 1764$

8. A) 85% of 120 = $120 \times 0.85 = 120 \times \frac{17}{20} = 6 \times 17 = 102$

9. C) $\frac{45}{250} = \frac{9}{50} = \frac{18}{100} = 18\%$

10. C) If John is J years old and Mary is M years old then: 1) $J = M + 20$ and in 5 more years we have:
2) $J + 5 = 3(M + 5)$ Substituting equation 1) into equation 2) we have: $M + 25 = 3M + 15 \xrightarrow{yields} 2M = 10$ $\xrightarrow{yields} M = 5$ so that by equation 1) John is 25 years old.

11. A) If 3 oranges cost $2.91 then 1 orange costs $\frac{2.91}{3} = \$0.97$ so that 5 oranges cost $5 \times 097 = \$4.85$

12. B) Since Bob builds walls at a rate of $\frac{1}{2}$ walls per hour and Carl builds at a rate of $\frac{1}{3}$ walls per hour, together they build walls at a rate of $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ walls per hour. Therefore they can build the wall in $\frac{6}{5}$ hours.

13. A) $\frac{1}{3} + \frac{1}{7} + \frac{4}{21} = \frac{7+3+4}{21} = \frac{14}{21} = \frac{2}{3}$

14. C) After multiplying the top and bottom by 5: $\frac{3+\frac{3}{5}}{4+\frac{4}{5}} = \frac{15+3}{20+4} = \frac{18}{24} = \frac{3}{4}$

15. E) Using the difference of squares factorization: $\left(\frac{3}{4} - \frac{1}{6}\right)\left(\frac{3}{4} + \frac{1}{6}\right) = \left(\frac{3}{4}\right)^2 - \left(\frac{1}{6}\right)^2 = \frac{9}{16} - \frac{1}{36} = \frac{81-4}{144} = \frac{77}{144}$

16. B) Using the rules for the order of operations $\frac{3}{13} + \frac{10}{13} \div \frac{5}{13} = \frac{3}{13} + \left(\frac{10}{13} \times \frac{13}{5}\right) = \frac{3}{13} + 2 = \frac{3+26}{13} = \frac{29}{13}$

17. BE $f\left(-\frac{1}{3}\right) = 3 \times \left(-\frac{1}{3}\right)^2 - \left(-\frac{1}{3}\right) + \frac{1}{8} = \frac{1}{3} + \frac{1}{3} + \frac{1}{8} = \frac{8+8+3}{24} = \frac{19}{24}$

18. C) $f\left(-\frac{3}{4}\right) = \sqrt{2\left(-\frac{3}{4}\right)^2 - \left(-\frac{3}{4}\right) + \frac{1}{8}} = \sqrt{\frac{9}{8} + \frac{6}{8} + \frac{1}{8}} = \sqrt{2}$

19. C) f(x) is defined for all x such that the bottom polynomial $(x + 5)(x + 6) \neq 0 = \{$x: $x \neq -5$ and $x \neq -6\}$

20. B) $(3x^2 - 6x + 1)(2x + 3) = (3x^2 - 6x + 1)(2x) + (3x^2 - 6x + 1)(3) = 6x^3 - 12x^2 + 2x + 9x^2 - 18x + 3$
$= 6x^3 - 3x^2 - 16x + 3$

21. C) $(3x^2 - 5x + 2) - (4x - 5) = 3x^2 - 5x + 2 - 4x + 5 = 3x^2 - 9x + 7$

22. E) $\frac{2}{2x+3} = \frac{4}{3x+4} \rightarrow 6x + 8 = 8x + 12 \rightarrow -2x = 4 \rightarrow x = -2 \rightarrow \frac{6}{4x+5} = \frac{6}{-3} = -2$

23. C) $\frac{x-2}{x+1} - \frac{x-2}{2x-3} = \frac{(x-2)(2x-3)-(x-2)(x+1)}{(x+1)(2x-3)} = \frac{2x^2-7x+6-(x^2-x-2)}{(x+1)((2x-3)} = \frac{x^2-6x+4}{(x+1)(2x-3)} = \frac{(x-4)(x-2)}{(x+1)(2x-3)}$

24. E) $(x - 2y)^2 = (x - 2y)(x - 2y) = x(x - 2y) - 2y(x - 2y) = x^2 - 2xy - 2xy + 4y^2 = x^2 - 4xy + 4y^2$

25. C) $(\sqrt{3} + \sqrt{12})^2 = (\sqrt{3} + 2\sqrt{3})^2 = (3\sqrt{3})^2 = 9 \times 3 = 27$

26. E) $(5x - 17) + 4(x + 2) - 3(x - 5) = -2(x - 1) + 7(x + 1) \rightarrow$
     $5x - 17 + 4x + 8 - 3x + 15 = -2x + 2 + 7x + 7 \rightarrow 6x + 6 = 5x + 9 \rightarrow x = 3$

27. D) $2x + 3y = 51 \rightarrow 6x + 9y = 153$ (1)
     $3x + 5y = 84 \rightarrow -6x - 10y = -168$ (2). Adding equations (1) and (2) yields $-y = -15 \rightarrow y = 15$
Susbstituting into equation (1) yields: $2x + 45 = 51 \rightarrow x = 3$. Therefore $x + y = 18$.

28. C) $120^2 = 144,000 < 145,000 < 169,000 = 130^2 \rightarrow 120 < \sqrt{145000} < 130$

29. B) $\sqrt[3]{-27} = -3$ because $(-3)^3 = -27$

30. E) $\frac{(x^{-3}\cdot x^{-5})^{-2}}{(x^{-6}\cdot x^{-10})^{-3}} = \frac{(x^{-8})^{-2}}{(x^{-16})^{-3}} = \frac{x^{16}}{x^{48}} = x^{-32}$. Therefore $b = -32$