

1 E 5 is seven less than 3 times $(x + 1)$

$$5 = 3 \times (x + 1) - 7$$

$$5 = 3x + 3 - 7$$

$$5 = 3x - 4$$

2 B $\frac{3}{x-3} - \frac{2}{x+3} = \frac{3(x+3) - 2(x-3)}{(x-3)(x+3)}$

$$= \frac{3x+9-2x+6}{x^2-9}$$

$$= \frac{x+15}{x^2-9}$$

3 C $A \cap (B \cup C) = A \cap \{1, 2, 3, 4, 5, 6, 7\}$
 $= \{2, 3, 4\}$

4 C $0.\dot{7}\dot{2} = 0.727272 \dots$

$$0.\dot{7}\dot{2} \times 100 = 72.7272 \dots$$

$$0.\dot{7}\dot{2} \times 99 = 72$$

$$0.\dot{7}\dot{2} = \frac{72}{99}$$

5 A $\frac{-4}{x-1} - \frac{3}{1-x} + \frac{x}{x-1} = \frac{-4}{x-1} + \frac{3}{x-1} + \frac{x}{x-1}$
 $= \frac{x-1}{x-1}$
 $= 1$

6 C $\frac{x+2}{3} - \frac{5}{6} = \frac{2x+4}{6} - \frac{5}{6}$
 $= \frac{2x-1}{6}$

7 C $a-1 = \frac{1}{1+b}$

$$\frac{1}{a-1} = 1+b$$

$$\frac{1}{a-1} - 1 = b$$

$$b = \frac{1}{a-1} - 1$$

8 A $0.\dot{3}\dot{6} = 0.363636 \dots$

$$0.\dot{3}\dot{6} \times 100 = 36.3636 \dots$$

$$0.\dot{3}\dot{6} \times 99 = 36$$

$$0.\dot{3}\dot{6} = \frac{36}{99} = \frac{4}{11}$$

$$\text{Numerator} + \text{denominator} = 4 + 11$$
$$= 15$$

9 B Multiply both sides by $4(2x + y)$.

$$4(2x - y) = 3(2x + y)$$

$$8x - 4y = 6x + 3y$$

$$8x - 6x = 3y + 4y$$

$$2x = 7y$$

$$\frac{2x}{2y} = \frac{7y}{2y}$$

$$\frac{x}{y} = \frac{7}{2}$$

$$\frac{x}{y} = \frac{7}{2}$$

- 10 B Multiply both sides by $(3 + y)$.

$$3 = 4(3 + y)$$

$$3 = 12 + 4y$$

$$-9 = 4y$$

$$y = -\frac{9}{4}$$

- 11 B Multiply the first equation by 5, then subtract.

$$15x + 5y = -35 \quad \textcircled{1}$$

$$2x + 5y = 4 \quad \textcircled{2}$$

$$\textcircled{1} - \textcircled{2} :$$

$$13x = -39$$

$$x = -3$$

$$3 \times -3 + y = -7$$

$$y = 2$$

$$(-3, 2)$$

- 12 A Multiply both sides by 4.

$$(m + 2) - (2 - m) = 2$$

$$m + 2 - 2 + m = 2$$

$$2m = 2$$

$$m = 1$$

- 13 D $2 \overline{)46\,200}$

$$2 \overline{)23\,100}$$

$$2 \overline{)11\,550}$$

$$3 \overline{)5575}$$

$$5 \overline{)1925}$$

$$5 \overline{)385}$$

$$7 \overline{)77}$$

$$11 \overline{)11}$$

$$\underline{\quad\quad}$$

$$= 2^3 \times 3 \times 5^2 \times 7 \times 11$$

- 14 B Order is $n - 6$, $n - 5$, $n - 1$, $n + 1$, $n + 4$. Middle number is $n - 1$.

$$\begin{aligned}
 15 \text{ B } \quad \frac{4}{n+1} + \frac{3}{n-1} &= \frac{4(n-1) + 3(n+1)}{(n+1)(n-1)} \\
 &= \frac{4n-4+3n+3}{n^2-1} \\
 &= \frac{7n-1}{n^2-1} \\
 &= \frac{7n-1}{n^2-1} \times \frac{-1}{-1} \\
 &= \frac{1-7n}{1-n^2}
 \end{aligned}$$

16 A Let the first number be x , so the numbers are x , $2x$ and $\frac{x}{2}$.

$$2x + x + \frac{x}{2} = 28$$

$$4x + 2x + x = 56$$

$$7x = 56$$

$$x = 8$$

(8, 16, 4)

$$\begin{aligned}
 17 \text{ A } \quad (\sqrt{7} + 3)(\sqrt{7} - 3) &= 7 - 9 \\
 &= -2
 \end{aligned}$$

$$\begin{aligned}
 18 \text{ C } \quad \frac{2x^2 - 9x + 4}{(x-4)(2x-1)} &= \frac{(x-4)(2x-1)}{(x-4)(2x-1)} \\
 &= \frac{P}{x-4} + \frac{Q}{2x-1} \\
 &= \frac{P(2x-1) + Q(x-4)}{(x-4)(2x-1)} \\
 &= \frac{2Px + Qx - P - 4Q}{(x-4)(2x-1)}
 \end{aligned}$$

$$2P + Q = 13 \quad \textcircled{1}$$

$$-P - 4Q = -10$$

$$-2P - 8Q = -20 \quad \textcircled{2}$$

$\textcircled{1} + \textcircled{2}$:

$$-7Q = -7$$

$$Q = 1$$

$$2P + 1 = 13$$

$$2P = 12$$

$$P = 6$$

$$\begin{aligned}
 19 \text{ A } \quad \frac{5x}{(x+2)(x-3)} &= \frac{P}{x+2} + \frac{Q}{x-3} \\
 &= \frac{P(x-3) + Q(x+2)}{(x+2)(x-3)} \\
 &= \frac{Px + Qx - 3P + 2Q}{(x+2)(x-3)}
 \end{aligned}$$

$$P + Q = 5$$

$$3P + 3Q = 15 \quad \textcircled{1}$$

$$-3P + 2Q = 0 \quad \textcircled{2}$$

$\textcircled{1} + \textcircled{2}$:

$$5Q = 15$$

$$Q = 3$$

$$P + 3 = 5$$

$$P = 2$$

- 20 E Assuming n is an integer, and $n = m^2$, then the next largest perfect square is $(m + 1)^2$

$$(m + 1)^2 = m^2 + 2m + 1$$

$$\text{Since } n = m^2, m = \sqrt{n}$$

$$(m + 1)^2 = n + 2\sqrt{n} + 1$$

The next largest perfect square is $n + 2\sqrt{n} + 1$.

- 21 C 0.4 and 4.125 are terminating decimals.

$$\frac{3}{8} = 0.125$$

$$\sqrt{16} = 4$$

Only $\sqrt{5}$ cannot be expressed as a rational number.

- 22 C $x = \frac{b}{a}$ and $y = \frac{1}{a-b}$

$$\begin{aligned} x + y &= \frac{b}{a} + \frac{1}{a-b} \\ &= \frac{b(a-b) + a}{a(a-b)} \\ &= \frac{ba - b^2 + a}{a(a-b)} \end{aligned}$$

- 23 E The perfect square could be

$$(3x - 2)^2 \text{ or } (3x + 2)^2$$

The middle term of the expansion would be $-12x$ or $12x$ respectively.

This means m would be 3 or -3 , i.e. ± 3 .

- 24 D $x = (n + 1)(n + 2)(n + 3)$, $n > 0$

When $n = 1$,

$$x = (1 + 1) \times (1 + 2) \times (1 + 3)$$

$$= 2 \times 3 \times 4 = 12$$

When $n = 2$,

$$x = (2 + 1) \times (2 + 2) \times (2 + 3)$$

$$= 3 \times 4 \times 5 = 60$$

1, 2, 3 and 6 are factors in both equations, but not 5.

- 25 A An odd number plus an odd number is always an even number, so $n + p$.

(The other options all produce odd numbers for all n and p .)

- 26 A $4a^2b^4 \times 3(ab^3)^{-2} = 12a^2b^4 \times a^{-2}b^{-6}$
 $= 12a^0b^{-2}$
 $= 12b^{-2}$

27 D
$$\frac{3 \times 10^8}{\sqrt{0.0144 \times 10^2}} = \frac{3 \times 10^8}{0.12 \times 10^2}$$
$$= 25 \times 10^6$$
$$= 2.5 \times 10^5$$

28 D Can only be D or E since 6 is a factor. Try both.

29 C
$$x^2 = (x - 2)^2 + b(x - 2) + c$$
$$x^2 = x^2 - 4x + 4 + b(x - 2) + c$$
$$\therefore b - 4 = 0 \text{ and } 4 - 2b + c = 0$$
$$\therefore b = 3 \text{ and } c = 4$$

30 B
$$\frac{50}{x} = \frac{70}{x + 25}$$
$$\therefore 70x = 50(x + 25)$$